Fishery Data Series No. 20-15

Anchor River Chinook Salmon Escapement, 2014

by

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and

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December 2020

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

In 2014, the Anchor River Chinook salmon (*Oncorhynchus tshawytscha*) escapement was fully enumerated with combined daily counts from the north and south forks of the Anchor River using weirs fitted with underwater video systems. The 2014 escapement (2,499) fell below the sustainable escapement goal (SEG) range of 3,800–10,000 Chinook salmon. It was the lowest escapement observed since Chinook salmon were first fully enumerated on the Anchor River in 2003. A series of emergency orders were issued in 2014 that restricted the inriver and nearby marine sport fisheries. The midpoint of the combined north and south fork Chinook salmon runs occurred on 15 June. No correlation was detected between daily Chinook salmon counts on the south fork and average river stage or average river temperature. Age composition was estimated from samples collected during weekly beach seining in the mainstem, downstream of the weirs. The dominant age class was ocean age 3 (40.4%; SE 3.0%). No significant differences were detected between mean lengths of ocean-age-3 males and females or between ocean-age-4 males and females. There were no significant differences between the proportion Chinook salmon ≤508 mm total length collected from beach seine samples and video weir observations. The escapement and age composition data will be used in a spawner-recruit analysis to derive appropriate escapement goals.

Keywords: Anchor River, Chinook salmon, *Oncorhynchus tshawytscha*, steelhead, *Oncorhynchus mykiss*, kelt, emigration, run timing, diel, sustainable escapement goal, stock status, weir, sonar, DIDSON

INTRODUCTION

The Anchor River is located on the southern portion of the Kenai Peninsula (Figure 1) and supports the largest Chinook salmon (*Oncorhynchus tshawytscha*) run in the Lower Cook Inlet Management Area (LCIMA; Booz et al. 2019). There are 3 streams open to sport fishing for Chinook salmon in the LCIMA: Anchor River, Deep Creek, and Ninilchik River. Chinook salmon run timing in these streams is early May through late July with a peak in early to mid-June. Based on scale age data, Anchor River Chinook salmon spend 1 to 4 years feeding in salt water before they return to spawn (Kerkvliet and Booz 2012).

The Anchor River watershed is approximately 587 km^2 with about 266 river kilometers (RKM) of anadromous streams (Table 1). The Anchor River has 2 major forks (south and north forks) and their confluence is located approximately 4.0 RKM[1] upstream from the mouth. The south fork watershed is approximately twice the size of the north fork watershed. Because of the Anchor River's small size, geomorphology, and vegetation, water flows can rise quickly and substantially following spring snow melt or after periods of heavy rains.

Since the inception of the Anchor River Chinook salmon escapement project in 2003, escapement has ranged from 3,455 in 2009 to 12,016 in 2004 (Table 2). The Anchor River Chinook salmon escapement goal has been refined as annual escapement data have become available (Appendix A2). The goal in place during this project was an SEG of 3,800–10,000 Chinook salmon set in 2010 (Otis et al. 2010). The SEG was set by using the full probability spawner–recruit model described in Szarzi et al. (2007) and updated with the most recent escapement and harvest through 2009. The lower end of the SEG was the point estimate for maximum sustained yield and the upper bound was the estimated carrying capacity.

Anchor River Chinook salmon are primarily harvested during an inriver sport fishery. Harvest in this fishery is restricted by regulation with daily and seasonal bag limits, and limits on the number of days and area open to sport fishing. The annual Chinook salmon catch and harvest in the Anchor River sport fishery is estimated by the Statewide Harvest Survey (SWHS; Table 3). From 2003 to

[1] River kilometer 2.8 was given for the forks in prior Anchor River Chinook salmon reports for 2010–2013. Distance to the forks confluence was remeasured in 2013 to RKM 4.0.

2013, the average SWHS Chinook salmon inriver harvest was 979 (Table 3); the average coefficient of variation of the SWHS estimates over the same period was 27%. Inriver exploitation rates have ranged from less than 0.8% in 2012 to 21.7% in 2008 (Table 2). Anchor River Chinook salmon are also harvested in the Upper Cook Inlet summer mixed-stock sport troll fishery, which has previously been within 1 mile of shore when runs of Cook Inlet Chinook salmon are low (Schuster et al. *In prep*).

Anchor River Chinook salmon sport fishing regulations have undergone a series of changes since the early 2000s as escapement assessment has improved (Appendix A3). Since 2009, the inriver and nearby marine fisheries have been restricted annually by emergency order (EO) in response to low Chinook salmon escapement. Additionally, in 2010, the Alaska Board of Fisheries (BOF) reduced the Anchor River annual limit to 2 Chinook salmon in combination with Deep Creek and extended the conservation zone surrounding the Anchor River mouth from 1 mile north and south to 2 miles north and south from 1 April to 30 June. This report is part of a continuing series designed to evaluate the Anchor River Chinook salmon stock. The Chinook salmon escapement estimates will be used in future escapement goal analyses and to manage the fishery according to the *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222) and the *Policy for Statewide Escapement Goals* (5 AAC 39.223).

Before 2003, there were problems enumerating the Anchor River Chinook salmon escapement over the entire run. Traditional sonar methods (e.g., split-beam sonar), commonly used in large Alaskan rivers at the time (e.g., the Kenai River), were not suited for smaller streams like the Anchor River because of periodic low water conditions that are too shallow to insonify. Also, traditional weir methods (fixed picket or resistance board weirs), commonly used in small streams, could not be installed in the Anchor River in May and early June because the river was typically too high and swift for installation. Therefore, an annual aerial survey was conducted during peak spawning to index and evaluate Chinook salmon escapement (Appendix A1). However, because of the inherent biases associated with the index counts (e.g., differences in survey conditions and surveyor biases), year-to-year comparisons of Chinook salmon escapement indices were difficult.

From 2003 through 2012, the Anchor River Chinook salmon escapement was monitored annually using a combination of technologies (Table 4, Appendix A1). In 2003, dual-frequency identification sonar (DIDSON) manufactured by Sound Metrics Corporation (SMC) was used to monitor the entire Chinook salmon escapement (Kerkvliet et al. 2008). The DIDSON was deployed on the mainstem just below the confluence of the north and south forks (RKM 4.0) at the upstream end of the fishery (Figure 2).

From 2004 to 2008 and 2010 to 2012, the Chinook salmon escapement was estimated by first using DIDSON from the early spring through early to mid-June, during high water levels, and then a resistance board weir thereafter (Table 4). In 2009, low water levels allowed for the immediate installation of the resistance board weir, which provided the first complete Anchor River Chinook salmon escapement census. Starting in August 2010, an underwater video system was incorporated into the resistance board weir and used to monitor escapement; in following years it was used throughout the resistance board weir operations (Kerkvliet and Booz 2018a–d). Starting in 2012, annual Chinook salmon escapement monitoring was ended on August 4 (last complete day was August 3) because only 1% of the run was observed in the remainder of August through mid-September in years when escapement was also monitored for later returning coho salmon.

In 2013, high river flows changed the channel morphology at the confluence of the north and south forks, which rendered the 2003–2012 mainstem monitoring site unsuitable (Kerkvliet and Booz 2018d). The DIDSON was relocated downstream to RKM 3.7, approximately 100 m downstream of the Old Sterling Highway Bridge, close to Bridge Hole (Figure 2). Once flows subsided, escapement was monitored with weirs at 2 upstream sites, 1 each on the south and north forks. The north fork site was located at RKM 5.5 and the south fork site at RKM 4.1 (Figure 3, Table 5). Weirs fitted with underwater video systems were used in 2013 at both sites to monitor escapement.

Anchor River Chinook salmon escapement counts based on DIDSON counts are biased low because all sonar images of fish swimming upstream and downstream are assumed to be Chinook salmon even though an unknown portion of the downstream sonar images include postspawning steelhead (*Oncorhynchus mykiss*), known as kelts, emigrating past the sonar. In 2009, when the entire Chinook salmon season was monitored with a weir, kelts were also monitored at the sonar-weir site (Kerkvliet and Booz 2012). The midpoint of the 2009 kelt emigration (7 June) was earlier than the midpoint of the Chinook salmon immigration (23 June). Given a typical weir installation date of early to mid-June and assuming the timing of the 2009 kelt emigration was typical, a large portion of the kelt emigration may occur during the DIDSON operation. Had the DIDSON been used in 2009 during the typical early spring high water period, the negative bias associated with kelt counts would have been up to 17%. However, this estimate of potential bias was based on the lowest escapement of Chinook salmon to date so this bias may be lower in years with average Chinook salmon escapement counts.

OBJECTIVES

OBJECTIVES

1) Estimate the Chinook salmon escapement that passes upstream of the Anchor River at RKM 4.1 on the south fork and at RKM 5.3 on the north fork from approximately 13 May through 4 August 2014.
2) Estimate the age and sex composition of the Chinook salmon escapement migrating to the Anchor River.
3) Census the sex composition during the video weir operation.

SECONDARY OBJECTIVES

1) Estimate length-at-age and length by sex of the Chinook salmon escapement using mid eye to tail fork length (METF).
2) Compare the proportion of Chinook salmon ≤508 mm total length (TL) estimated from video weir counts to the proportion (≤508 mm TL) observed in beach seining; this comparison will test the hypothesis that our age samples from the beach seining are representative of the overall escapement.
3) Compare the proportion of female Chinook salmon calculated from a (large) sample of images from the video weir to the proportion observed in beach seining.
4) Examine all Chinook salmon sampled for age, sex, and length (ASL) for wild or hatchery-reared origin as defined by the absence of the adipose fin in hatchery-reared fish.

5) Determine seasonal and diel run timing of Chinook salmon and steelhead[2] during weir operations.
6) Measure water depth and temperature throughout the DIDSON and mainstem weir operations.

METHODS

OPERATION DATES AND EQUIPMENT

In 2014, favorable stream levels allowed installation of a resistance board weir on the south fork at RKM 4.1 (lat 59°46.719′N, long 151°49.107′W) on 14 May and a fixed picket weir on the north fork at RKM 5.5 (lat 59°46.323′N, long 151°49.935′W) on 7 May (Figure 3, Table 5). Each weir was fitted with an underwater video system in the passage chute to monitor escapement (Figure 4). Both weirs were operated through August 3. The underwater video system allowed fish passage 24 hours a day, 7 days a week. Each week from 15 May to 11 July, the mainstem was beach seined from RKM 3.8 to RKM 1.7 to capture Chinook salmon for ASL compositions estimation.

South Fork Weir

A 31 m long resistance board weir was installed on 14 May. Picket spacing for the weir and live box was approximately 2.8 cm (1.5 in) to block the passage of all but the smallest ocean-age-1 Chinook salmon. An underwater video system was attached to the upstream edge of the weir and about 3 m from the right bank near the thalweg of the river (Figure 4). All bottom irregularities along the base of the floating weir were sealed using sandbags and a fencing skirt. The weir was visually inspected daily for holes to ensure no fish could migrate past undetected.

At the start of weir operation, 4-meter long fixed-picket weir abutments were installed on both sides of the upstream end of the video system to encourage steelhead kelts to migrate downstream through the video system and live box. On 31 May, these abutments were removed because they might compromise the integrity of the weir. On 2 June, a "steelhead chute" was formed near the thalweg of the river by weighting the downstream end of a resistance board weir panel with a sandbag. The weight of the sandbag allowed a shallow stream of water that fish could use to swim downstream over the weir. The placement of the sandbag was used to adjust the water depth flowing over the weir panel so that it was deep enough to allow kelts to swim downstream, but shallow enough to prevent upstream migration. All steelhead observed by the video system were counted by direction of movement, but counts were incomplete after 31 May due to removal of the abutments and installation of the steelhead chute.

The underwater video system was composed of an underwater camera mounted in a sealed box, a fish passage chute, a power system, and a desktop computer video recording system. The camera box was roughly 80 cm by 90 cm and was constructed with 4.1 mm aluminum. The camera was mounted in the rear and at the bottom of the camera box and was pointed towards the front through the 45 cm by 80 cm glass that was 9.5 mm thick. The inside walls of the passage chute were painted a warm white to help with light reflection. At least six 20 W halogen lights were installed within the camera box for consistent illumination throughout the day. During installation, the camera box was filled with distilled water through a hatch to provide a clearwater lens for the camera and to sink the camera box in place. The hatch was located on the top of the box above the camera and

[2] Operation of weirs for the duration of the project allowed estimation of the run timing of steelhead; this secondary objective was not in the original 2014 operational plan.

sealed with a rubber gasket and bolts to prevent any river water from entering the box. The camera and light cords were fed through a sealed tube on top of the camera box that extended well above the water line. The fish passage chute was roughly 1 m long, had a removable lid to block out most light, and restricted fish passage down to roughly 20 cm in length. The removable lid allowed the outside of the camera box glass and the inside of the fish passage chute to be cleaned. The backdrop of the fish chute was marked with vertical lines 508 mm apart (from the outside edge to the outside edge of both lines) to allow Chinook salmon to be categorized into 2 size classes. The camera box was attached to the side of the fish passage chute so fish swimming up the chute were in the camera's field of view through the glass pane.

The video system recorded fish passage 24 hours per day using a desktop computer that was installed with a digital video recorder (DVR) capture card and motion detection software. All video files were recorded at 30 frames per second and written to a 3-terabyte external hard drive. The computer was stored inside a metal toolbox and powered with a generator and battery system. Video files of motion-detected fish images were reviewed with Watchnet software provided by the DVR capture card manufacturer.

North Fork Weir

A standard fixed-picket weir was used to monitor escapement. Picket spacing of the weir and live boxes was approximately 2.8 cm (1.5 in) to block the passage of all but the smallest ocean-age-1 Chinook salmon. All bottom irregularities along the base of the weir were sealed using sandbags. The weir was visually inspected daily for holes to ensure no fish could migrate past undetected.

A live box was attached to the upstream edge of the weir and an underwater video system was installed within the live box. The live box–underwater video system was installed about 1.5 m from the right bank near the thalweg of the river. The underwater video system was identical to that described above for the south fork. Fixed picket weir abutments (about 1.5 m long) were installed on both sides of the upstream end of the live box to encourage steelhead kelts to migrate downstream through the video system and live box; these abutments remained in operation on the north fork for the duration of the steelhead migration.

ESCAPEMENT MONITORING

Video recordings were reviewed for each fork. For each hour of video, fish were identified to species and tallied by passage direction (upstream or downstream). Daily escapement counts for each fork were the sum of the net (upstream minus downstream) hourly counts. Total daily counts were the combined net counts for each fork.

RUN TIMING

Run timing was assessed for both Chinook salmon and steelhead runs at each fork using cumulative daily net counts and hourly upstream and downstream counts. The association of daily south fork Chinook salmon escapement counts with daily water temperature and river stage was also assessed.

Water temperature was recorded by datalogger every 15 minutes by Cook Inlet Keeper (CIK), a citizen-based nonprofit group. The logger was installed approximately 0.1 RKM downstream of the confluence of the north and south forks (Mauger 2013). Daily temperatures (average, minimum, and maximum) were averaged from logger readings collected every 15 minutes.

River stage was recorded hourly from a gauge station (USGS 15239900) by the U.S. Geological Survey (USGS). The station is located on the south fork at approximately 11.4 RKM from the mouth of the Anchor River at the New Sterling Highway Bridge.

BIOLOGICAL DATA

As video recordings were reviewed, Chinook salmon size (total length, TL) composition was assessed using the marks on the background of the fish chute. Chinook salmon ≤508 mm TL were reported as jacks and those >508 mm TL were reported as adults. Sex composition was also assessed from video images at each weir site by examining external characteristics of Chinook salmon. Sex was recorded as unknown if sex could not be determined from external characteristics.

In past years, there have been problems obtaining ASL data at both weirs because Chinook salmon were reluctant to enter a live box for sampling. A more representative ASL sample of the migration may be obtained by systematically beach seining in the mainstem river downstream of the weirs throughout the season. Thus, Chinook salmon ASL compositions were estimated from beach seine surveys on the mainstem from Bridge Hole at RKM 3.8 to RKM 1.7 weekly from 15 May through 11 July (Kerkvliet et al. 2008). The seine was 30.5 m long by 2 m deep with 5.1 cm stretched mesh size. The sampling regimen was partially assessed by comparison of the sex and jack composition of the ASL sample to that calculated from the weir. To assess jack composition, seine-captured fish were assigned to a ≤508 mm TL or >508 mm TL size class and tallied. Mid eye to tail fork (METF) length was recorded to the nearest 5 millimeters to examine size-at-age. To assess age, 3 scales from the preferred area on the fish's left side were collected from each captured Chinook salmon and mounted to a gum card (Welander 1940). Sex was visually determined through external characteristics. Prior to being released, the upper lobe of the caudal fin was clipped on all Chinook salmon to prevent double sampling. The species composition of the beach seine catches was also recorded. Beach seining was terminated for the season near the end of the Chinook salmon migration and after the Dolly Varden catch rates increased.

Ocean age of sampled fish was determined from collected scales using a microfiche reader and methods described by Welander (1940). Age was determined without reference to size, sex, or other data, and this was done twice to estimate within-reader variability. Since 2007, the age of Anchor River Chinook salmon scales has been determined by the same individual; the individual is tested annually with known-age scales (from recovered coded-wire-tagged fish). All scale samples that had conflicting ages for the 2 estimates were re-examined to produce a resolved age, which was then used for composition and abundance estimates.

ADIPOSE-FINCLIPPED CHINOOK SALMON

The presence or absence of an adipose fin was assessed for every Chinook salmon counted through the video weirs and captured during beach seining. If during beach seining, a fish was found missing an adipose fin, it was sacrificed, and the head was shipped to the ADF&G Mark, Tag, and Age Lab for coded-wire-tag (CWT) recovery to determine the release site.

DATA ANALYSIS

Escapement and Run Timing

Chinook salmon

Net upstream daily counts (upstream minus downstream) were calculated for the north and south forks separately and then summed to determine total daily escapement for the Anchor River. Chinook salmon run timing was described using cumulative daily net upstream counts and associated percentages at the north and south fork weir sites. Diel run timing was evaluated using 24-hour video weir counts. Video weir counts were summed over the season by hour and plotted against hour of day.

Pearson's correlation coefficient (r) was examined between the daily counts at the south fork monitoring site within the middle 80% of the run and daily river stage and river temperature averages. The association of daily river stage and river temperature averages from 1 May through 4 August were also examined using Pearson's correlation. For all tests, the hypothesis of no correlation ($r = 0$) was tested. Correlations of daily net upstream counts with river stage and temperature at the north fork were not assessed because stage height was not measured and temperatures were not consistently recorded.

Steelhead

Steelhead run timing was described based on upstream, downstream, and net counts at the north and south fork weir sites. Diel run timing was evaluated using 24-hour video weir counts. Video weir counts were summed over the season by hour and plotted against hour of day.

Biological Data

Age and sex compositions were estimated from all pooled samples obtained throughout the season. The estimated proportion of Chinook salmon of age or sex class k (or a combination thereof) in the escapement was calculated as follows:

$$\hat{p}_k = \frac{n_k}{n} \tag{1}$$

where n is the number of salmon sampled and $n_k$is the total number of salmon of age or sex class k in n.

The estimated variance of proportion ($\hat{p}_k$) was calculated as

$$\text{var}(\hat{p}_k) = \left[\left(\frac{C-n}{C}\right)\frac{\hat{p}_k(1-\hat{p}_k)}{n\ -1}\right] \tag{2}$$

where C is total escapement of Chinook salmon in 2014.

The estimated total number of Chinook salmon of age or sex class k was calculated as follows:

$$\widehat{N}_k = C\hat{p}_k \tag{3}$$

The estimated variance of $\widehat{N}_k$ was calculated as

$$\text{var}(\hat{N}_k) = C^2 \text{ var}(\hat{p}_k) \tag{4}$$

Mean length-at-age and its variance were estimated using standard statistics. Differences in mean length by sex and age combinations were tested with *t*-tests.

The within-reader variability of Chinook salmon scale age estimates was calculated using a coefficient of variation (CV) expressed as the ratio of the standard deviation over the mean age (Campana 2001):

$$CV_j = 100\% x \frac{\sqrt{\sum_{i=1}^{R} \frac{(X_{ij} - X_j)^2}{R-1}}}{X_j} \tag{5}$$

where

X_{ij} = the *i*th age estimate of the *j*th fish,

X_j = the mean age estimate of the *j*th fish, and

R = the number of times each fish is aged.

The proportions of Chinook salmon ≤508 mm TL and the proportion of males calculated from video recordings were compared to the proportions estimated from beach seine samples, respectively. *Z* tests were used to test the comparisons using the assumption that the estimated proportions were approximately normally distributed.

RESULTS

ESCAPEMENT

The 2014 Anchor River Chinook salmon escapement of 2,499 fish was below the SEG range of 3,800–10,000 fish (Table 2, Appendix B1). The combined escapement was based on net upstream counts of 1,161 Chinook salmon at the south fork weir (Table 6, Appendix B2) and 1,338 Chinook salmon at the north fork weir at RKM 5.5 (Table 6, Appendix B3). On the south fork (RKM 4.1), a computer malfunction resulted in missing hourly counts from 2130 hours on 20 May through 0630 hours on 21 May. In addition, during the early morning hours on 31 May, high river levels compromised the south and north fork weirs through 1 June. The missing counts were interpolated from hourly counts averaged from 1 day before and after the day in which counts were missing. No account was taken to incorporate additional variation in the final escapement estimate induced by the interpolation; less than 0.0001% of the final escapement was interpolated. There was no missing video footage at the north fork monitoring site.

RUN TIMING

Chinook Salmon

The midpoint of the Anchor River Chinook salmon run combined over both forks was 16 June (Figure 5, Appendix B1). The midpoint for the south fork weir was 10 June and the midpoint for

the north fork weir was 21 June (Appendices B2 and B3). The middle 80% of the run was counted from 25 May to 16 July (53 days) on the south fork and from 30 May to 15 July (47 days) on the north fork.

The correlation between the average daily river stage at RKM 11.4 on the south fork and the average daily river temperature at RKM 3.9 for the entire monitoring period from 7 May through 3 August was significantly negative ($r = -0.754$, df = 87, $P < 0.001$; Appendices C1 and C2). No significant correlation was detected between average south fork daily river stage and south fork daily counts ($r = 0.04$, df = 51, $P = 0.8$), but a significant correlation was detected between average daily river temperature and daily counts ($r = -0.4$, df = 51, $P = 0.004$) (Figures 6 and 7). Correlations of daily net upstream counts with river stage and temperature at the north fork were not assessed because stage height was not measured and temperatures were not consistently recorded.

On the south fork, 79% of all observed Chinook salmon were counted moving upstream through the video box from 0000 to 0359 hours, whereas 45% were counted moving upstream through the north fork video box for this same time period. Very few Chinook salmon migrated between 0500 and noon; only 2% and 7% of the south and north fork counts, respectively, migrated during this period (Figure 8).

Steelhead

The weir abutments effectively directed steelhead through the video box at both the south fork and north fork weir sites (Appendices D1 and D2). At both weir sites, most of the upstream- and downstream-moving steelhead were counted from midnight to 0359 hours (Figures 9 and 10). Of the total number of steelhead counted moving upstream at the south and north fork sites (46 and 202, respectively), 83% and 54% were counted within this 4-hour period, respectively. Of the total number of steelhead counted moving downstream through the south and north forks (63 and 365, respectively) 100% and 79% were counted within this 4-hour period, respectively. Run timing of steelhead on the south fork cannot be estimated due to a substantial drop in steelhead passage upon the removal of the abutments on 31 May and subsequent installation of the unmonitored steelhead chute on 2 June. Before the abutments were removed, the steelhead cumulative counts were 41 upstream and 58 downstream from 14 to 30 May.

Run timing of steelhead on the north fork is depicted in Figure 11 and tabulated in Appendix D2. There was a net upstream movement from 7 to 13 May (107 upstream vs. 73 downstream), after which downstream movement dominated. Over the season, 96% of the downstream moving steelhead were counted by 30 May. The middle 80% of the upstream counts were counted from 8 to 23 May, and the middle 80% of downstream counts were counted from 10 to 29 May.

BIOLOGICAL DATA

A total of 302 Chinook salmon were captured during beach seine surveys; however, 1 escaped prior to the collection of age and sex data. Therefore, the age and age-sex compositions were estimated from 301 Chinook salmon scale samples (Table 7). Age could not be resolved for 34 samples. Ocean age 3 was the dominant age class (40.4%, SE 3.0%; Table 7). Ocean age 2 was the dominant age class for males (36.0%, SE 2.9%), whereas ocean age 3 was the dominant age class for females (24.7%, SE 2.6%). No significant differences were detected between the mean length of ocean-age-3 males (765 mm, SE 9) and females (772 mm, SE 5) nor between

ocean-age-4 males (876 mm, SE 9) and females (834 mm, SE 12). The coefficient of variation (Equation 5) of all age estimates from Chinook salmon scales was 1.07%.

Of the 301 Chinook salmon sampled and measured for size during beach seining, 43 were less than or equal to 508 mm TL (jacks) and 258 were greater than 508 mm TL. Of the 2,499 Chinook salmon that escaped upstream of the video weirs, 281 were less than or equal to 508 mm TL (jacks) as determined by markings on the passage chute. The estimated proportion of jacks from the beach seine samples was not statistically different at the 5% level from the known proportion calculated from the video weir ($z = 1.64$; $P = 0.1$).

The sex of 2,774 Chinook salmon was determined from both video images ($n = 2{,}473$) and beach seine samples ($n = 301$). Sex could not be determined for 26 video samples. The estimated male to female ratio was 3.0:1 based on video images and 2.3:1 based on beach seine samples. The estimated proportion of males from the beach seine sample was significantly different at the 5% level from known proportion of males calculated from the video ($z = 2.26$; $P = 0.024$).

ADIPOSE-FINCLIPPED CHINOOK SALMON

Of the 2,499 Chinook salmon examined migrating upstream through the 2 weirs, the adipose fin was missing on 1 upstream-bound Chinook salmon. Of the 302 Chinook salmon captured during beach seining, 4 Chinook salmon were missing an adipose fin. No CWTs were detected in the 4 sacrificed fish.

OTHER SPECIES

Beach seine catches and weir counts in May were composed of only Chinook salmon or steelhead (Table 8). Dolly Varden were first observed in beach seine catches on June 4 and first observed at a video weir (south fork) on June 9 (Appendix B1). Pink salmon were first observed in beach seine catches on July 3 and first observed at a video weir (north fork) on July 4. No chum, sockeye, or coho salmon were observed in beach seine catches; however, low numbers were observed at the video weirs.

DISCUSSION

The 2014 Chinook salmon escapement of 2,499 was below the sustainable escapement goal (SEG) range (3,800–10,000) and was the lowest on record since 2003 (Table 2). The total inriver run (2,702 Chinook salmon) also fell well below the lower SEG bound and highlights the low run size (Table 2).

The following regulations that were adopted during the 2013 BOF meeting became effective during the 2014 season (Kerkvliet et al. 2016):

1) After harvesting a Chinook salmon 20 inches or longer, anglers were required to stop fishing in all roadside streams for the remainder of the day.
2) From July 1 to 15, gear was limited to 1 unbaited, single-hook, artificial lure on the Anchor River, Deep Creek, and Stariski Creek.
3) The southern boundary from the Anchor River in the *Early Run King Salmon Management Plan* was shifted about one-quarter mile north to the Anchor Point Light (lat 59°46.14′N).

A series of preseason EOs (2-KS-7-01-14, 2-KS-7-02-14, and 2 KS-7-03-14) closed the 5 Wednesday openings; extended the closed area from the confluence of the north and south forks

to the downstream side of the Old Sterling Highway Bridge; set a combined annual limit at 2 Chinook salmon for the Anchor River, Deep Creek, and Ninilchik River, and the saltwater areas between the latitude of Bluff Point and the mouth of the Ninilchik River; and restricted gear to an unbaited single-hook artificial lure. Because escapement continued to lag and was projected to fall below the SEG, EO 2-KS-16-14 closed the Anchor River to sport fishing for the 4th and 5th weekend openings and prohibited sport fishing for Chinook salmon within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point.

The SWHS estimated the 2014 Chinook salmon freshwater harvest from the Anchor River was 203 (SE 74; Table 3), which resulted in an estimated exploitation of 7.5% (Table 2). In 2014, a wildfire near Soldotna on Funny River road resulted in evacuations and an air quality advisory on 21 May for the Kenai Peninsula, which hampered anglers traveling to the Anchor River. In general, fishing conditions were good during the 1st and 3rd weekend openings and poor on the 2nd weekend due to high and turbid water conditions. Effort was low for the entire season and was attributed to preseason EO restrictions and in part to the Funny River wildfire. Chinook salmon harvest and catch in 2014 improved over the 2012 and 2013 seasons (Table 3), but the poor run size (Table 2) and fishing restrictions limited the fishery.

Historically, river levels have been used to predict daily fish passage at the monitoring sites. In general, when river levels increase, it is believed that fish counts also increase. In 2014, however, no correlation was found between counts and stage for the south fork. In contrast to daily fish passage, diel passage appeared to be very predictable; most Chinook salmon migrated during the early morning hours. This pattern has been observed in previous years for the Anchor River (Kerkvliet et al. 2008, 2012; Kerkvliet and Burwen 2010; Kerkvliet and Booz 2012; Table 5). Although the north fork drainage is much smaller than the south fork, the north fork accounted for approximately half of the escapement in 2014. This is a departure from 2004, when the north fork weir was last operated, and when only 16% of the Chinook salmon counted in the mainstem was accounted for in the north fork (Kerkvliet et al. 2008). In 2004, the weir was located approximately 0.5 RKM downstream from the 2014 site and only operated during daylight hours. The lower percentage of the total Chinook salmon escapement accounted for in the north fork in 2004 compared to 2014 may have been because of differences in both run size and timing of weir operations between the two years. In 2014, fish were allowed to migrate upstream of the weir freely, whereas in 2004, fish were allowed to pass upstream through the weir only during daylight hours. Furthermore, the run in 2004 was nearly 5 times greater than the 2014 run (Table 2). A better understanding of the relative run strengths in the north fork compared to the south fork Anchor River will probably emerge in subsequent years, as escapement is monitored for both forks.

In 2014, the collection of ASL samples once weekly downstream of the weirs with beach seines proved to be more efficient than collecting samples from the live box of the video weir in other recent years. No statistically significant difference was detected in the jack composition between beach seine samples and video weir observations. This result suggests that the ASL compositions derived from beach seine samples were suitably unbiased. However, a statistical difference was detected in sex composition from the two methods. Sex could be determined for all Chinook salmon captured in beach seines. Sex could not be determined for 26 Chinook salmon observed at the video weir, which resulted in inequivalent sampling and could potentially introduce some bias if one sex was more easily determined than the other in video images.

We also saw proportionally fewer Chinook salmon strays (adipose-finclipped fish) in the video weir footage than in the beach seine sample. Some of this difference can be attributed to the sacrifice of strays when captured during beach seining that occurred below the weir. However, the detection of only 1 adipose-finclipped fish in the video footage suggests either a biased beach seine sample or that adipose finclips were not being detected in the video footage. The low clip rate observed in the video footage is likely due to detection problems, either via observer error and (or) poor image quality.

The return of ocean-age-4 Chinook salmon in 2014 marked the final adult return from brood year 2008 and the fifth year that production could be fully assessed (Tables 9 and 10). The return (3,893 fish) from the 2008 escapement (5,806 fish, SE 169) was 0.67 recruits per spawner (Table 10). The brood year 2008 production was similar to the brood year 2007 production of 0.51. Since 2009, average inriver run size (4,434 fish) has been approximately half the 2003–2008 average (10,979; Table 2). The lower production of Anchor River Chinook salmon since 2009 reflects an overall downward trend also observed for other Cook Inlet and Alaskan stocks (ADF&G Chinook Salmon Research Team 2013).

Since the inception of monitoring Chinook salmon on the Anchor River in 2003, except 2009 and 2014, monitoring has started the season using DIDSON because of high river levels in the spring (Kerkvliet and Booz 2018c). In both 2009 and 2014, weirs were operated at the beginning of the season because river levels were low enough for weir installation. The early weir operations provided an opportunity to evaluate bias caused by steelhead during the DIDSON counting period. In 2009, the bias was calculated to be 17% (Kerkvliet and Booz 2012). For 2014, however, bias can only be calculated for the north fork; the south fork was not enumerated fully for steelhead. It is noted that the DIDSON is never used on the north fork, but we feel a calculation of potential bias is useful nevertheless. As noted earlier, steelhead migrations complicate the counting of Chinook salmon when the DIDSON is used. All DIDSON images are assumed to be Chinook salmon, but some images are known to be downstream-moving kelts and some are known to be steelhead moving upstream to spawn. Steelhead counts from 2014 suggest that escapement on the north fork would have been underestimated by 12% if the DIDSON had been used due to net kelt emigration. To minimize bias in future years, transitioning to weir operations should occur as soon as water levels allow and potential bias should be carefully considered in years of low Chinook salmon runs.

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TABLES

Table 1.–Drainage characteristics of the north and south forks of the Anchor River.

	Anchor River		
Drainage characteristics	North fork	South fork	Total
Watershed area (km^2)	182	405	587
Wetland area (km^2)	93	189	282
Percent wetland	51	47	48
Stream length (RKM)	149	352	501
Anadromous stream length (RKM)	90	176	266

Source: S. Baird, Research Analyst, Kachemak Bay Research Reserve in Homer, AK, unpublished data, 2006.
Note: "RKM" means river kilometers.

Table 2.–Anchor River Chinook salmon escapement, freshwater harvest, total run, and exploitation estimates, 2003–2014.

Year	Escapement goal [a]	Project dates	Escapement		Inriver harvest		Total inriver run [b]	
			Estimate	SE	Estimate	SE	Estimate	Exploitation rate (%)
2003	750–1,500 [c]	May 30–Jul 09	9,238	0 [c]	1,011	157	10,249	9.9 [d]
2004	750–1,500	May 15–Sep 15	12,016	283 [e]	1,561	198	13,577	11.5
2005	No goal	May 13–Sep 09	11,156	229 [e]	1,432	233	12,588	11.4
2006	No goal	May 15–Aug 24	8,945	289 [e]	1,394	197	10,339	13.5
2007	No goal	May 14–Sep 12	9,622	238 [e]	2,081	326	11,703	17.8
2008	5,000	May 13–Sep 12	5,806	169 [e]	1,612	241	7,418	21.7
2009	5,000	May 12–Sep 11	3,455	0 [f]	737	212	4,192	17.6
2010	5,000	May 13–Sep 29	4,449	103 [e]	364	118	4,813	7.6
2011	3,800–10,000	May 13–Sep 21	3,545	0 [e]	573	163	4,118	13.9
2012	3,800–10,000	May 14–Aug 3	4,509	100 [e]	38	100	4,547	0.8
2013	3,800–10,000	May 15–Aug 3	4,401	117 [e]	97	55	4,498	2.2
2014	3,800–10,000	May 5–Aug 3	2,499	0 [f]	203	74	2,702	7.5
Average								
2009–2013			4,072		362		4,434	8.4
2003–2013			7,013		991		8,004	11.6

Source: Harvest estimates from Alaska Sport Fishing Survey database (Internet) 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited August 2015). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] Sustainable escapement goal (SEG) used to manage the fishery. The 2003 and 2004 SEG based on aerial index count (Otis and Hasbrouck 2004). The 2008–2011 SEG is based on a Ricker recruitment model (Szarzi et al. 2007; Otis et al. 2010).

[b] "Total inriver run" is escapement plus freshwater harvest; total does not account for the marine harvest.

[c] Estimate is based on a census of all DIDSON files. Escapement was not fully assessed due to operation dates did not spanning the entire run.

[d] Exploitation may be overestimated in this year because escapement was not fully enumerated.

[e] Estimate is based on expanded DIDSON counts and weir counts.

[f] Escapement is based on weir counts.

Table 3.–Statewide Harvest Survey estimates of Chinook salmon harvest and catch compared to the number of days open to harvest for Anchor River Chinook salmon, 1977–2014.

	Chinook salmon				Chinook salmon opening days				
	Harvest				Weekend days [a]			Harvest	
Year	Estimate	SE	Catch estimate	Percent harvest	Before MD [b]	MD or after [b]	Wednesdays	Total days open [c]	Harvest per day
1977	1,077	–	NA	NA	0	8	0	8	135
1978	2,109	–	NA	NA	0	12	0	12	176
1979	1,913	–	NA	NA	0	12	0	12	159
1980	605	–	NA	NA	0	12	0	12	50
1981	1,069	–	NA	NA	0	12	0	12	89
1982	718	–	NA	NA	0	12	0	12	60
1983	1,269	–	NA	NA	0	12	0	12	106
1984	998	–	NA	NA	0	12	0	12	83
1985	672	–	NA	NA	0	12	0	12	56
1986	1,098	–	NA	NA	0	12	0	12	92
1987	761	–	NA	NA	0	12	0	12	63
1988	976	–	NA	NA	0	15	0	15	65
1989	578	–	NA	ND	0	15	0	15	39
1990	1,479	–	4,119	36	0	15	0	15	99
1991	1,047	–	2,540	41	0	15	0	15	70
1992	1,685	–	4,506	37	0	15	0	15	112
1993	2,787	–	6,022	46	0	15	0	15	186
1994	2,478	–	3,890	64	0	15	0	15	165
1995	1,475	–	3,545	42	0	15	0	15	98
1996	1,483	201	6,594	22	0	15	0	15	99
1997	1,563	186	5,289	30	0	15	0	15	104
1998	783	119	2,443	32	0	15	0	15	52
1999	1,409	192	6,903	20	0	15	0	15	94
2000	1,730	193	5,200	33	0	15	0	15	115
2001	889	162	2,415	37	0	15	0	15	59
2002	1,047	192	4,103	26	0	12	0	12	87

-continued-

Table 3.–Page 2 of 2.

Year	Chinook salmon Harvest Estimate	SE	Catch estimate	Percent harvest	Chinook salmon opening days Weekend days [a] Before MD [b]	MD or after [b]	Wednesdays	Harvest Total days open [c]	Harvest per day
2003	1,011	157	4,311	23	0	12	0	12	84
2004	1,561	198	5,561	28	0	15	0	15	104
2005	1,432	233	5,028	28	3	12	0	15	95
2006	1,394	197	4,638	30	3	12	0	15	93
2007	2,081	326	9,792	21	3	12	0	15	139
2008	1,486	241	3,245	46	3	12	5	20	74
2009	737	212	2,296	32	3	6	3	12	61
2010	364	118	889	41	3	6	3	12	30
2011	573	163	1,227	47	3	6	3	12	48
2012	38	23	189	20	3	6	0	9	4
2013	97	55	423	23	3	9	0	12	8
2014	203	74	926	22	3	9	0	12	17
Average									
2003–2013	979	175	3,418		2	10	1	14	67
1977–2013	1,202	176	3,965 [d]		1	12	0	13	88

Source: Alaska Sport Fishing Survey database (Internet) 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited August 2015). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Note: "Harvest" is number of fish kept, "catch" is fish harvested plus released, "NA" means not applicable, and an en dash means not calculated.

[a] Weekend openings consisted of Saturday and Sunday from 1977 to 1987 and Saturday–Monday since 1988.

[b] MD means Memorial Day weekend.

[c] Days open for Chinook salmon harvest (regulatory openings adjusted by emergency orders as needed).

[d] Average for 1990–2013.

Table 4.–Anchor River weir and DIDSON fish counts by species, 1987–1995 and 2003–2012.

Year	Project dates	Location (RKM) [a]	Method	Fish counts						
				Chinook salmon [b]	Dolly Varden [c]	Pink salmon [c]	Chum salmon	Sockeye salmon	Coho salmon [d]	Rainbow trout and steelhead [e]
1987 [f]	Jul 04–Sep 10	2.9	fixed picket weir	204	19,062	2,084	19	33	2,409	136
1988 [f]	Jul 03–Oct 05	2.9	fixed picket weir	245	14,935	777	24	30	2,805	878
1989 [f]	Jul 06–Nov 05	2.9	resistance board weir	95	11,384	4,729	165	212	20,187	769
1990 [f]	Jul 04–Aug 15	2.9	resistance board weir	144	10,427	355	17	39	190	3
1991 [f]	Jul 04–Aug 15	2.9	resistance board weir	39	18,002	1,757	9	46	13	5
1992 [f]	Jul 04–Oct 01	2.9	resistance board weir	129	10,051	992	39	174	4,596	1,261
1993 [f]	Jul 03–Aug 16	2.9	resistance board weir	90	8,262	1,019	12	71	290	1
1994 [f]	Jul 03–Aug 16	2.9	resistance board weir	111	17,259	723	2	61	420	1
1995 [f]	Jul 04–Aug 12	2.9	resistance board weir	112	10,994	1,094	4	73	725	10
2003 [g]	May 30–Jul 09	4.0	DIDSON	9,238 [h]	–	–	–	–	–	–
2004 [g]	May 15–Sep 13	4.0	DIDSON, resist. board weir	12,016 [h,i]	7,846	1,079	79	45	5,728	20
2005 [g]	May 13–Sep 09	4.0	DIDSON, resist. board weir	11,156 [h,i]	5,719	4,916	146	319	18,977	98
2006 [g,j]	May 15–Aug 24	4.0	DIDSON, resist. board weir	8,945 [h,i]	234	954	45	38	10,181	2
2007 [g]	May 14–Sep 12	4.0	DIDSON, resist. board weir	9,622 [h,i]	1,309	3,916	156	200	8,226	325
2008 [g]	May 13–Sep 11	4.0	DIDSON, resist. board weir	5,806 [h,i]	1,344	2,017	66	52	5,951	258
2009 [g]	May 12–Sep 11	4.0	resistance board weir	3,455	1,404	4,975	68	62	2,692	85
2010 [g]	May 13–Sep 29	4.0	DIDSON, resist. board weir	4,449 [h,i]	1,352	972	67	212	6,014	586
2011 [g]	May 13–Sep 21	4.0	DIDSON, resist. board weir	3,545 [h,i]	1,523	2,169	60	47	1,866	137
2012 [g]	May 14–Aug 03	4.0	DIDSON, resist. board weir	4,509 [h,i]	2,125	321	27	6	32	1

[a] River kilometers (RKM) 1.6 and 2.8 for the mainstem site in prior Anchor River Chinook salmon reports for 2010–2013 were remeasured in 2013 from the mouth of the Anchor River to RKM 2.9 and 4.0, respectively.

[b] Chinook salmon counts represent escapement because there is no harvest above the monitoring site. The run was only partially counted in 1987–1995 due to weir operation dates and location, and in 2003 due to weir operation dates.

[c] Incomplete Dolly Varden and pink salmon counts due to picket spacing of the weir (2004–2008) because smaller fish were able to pass through the weir pickets undetected.

[d] Incomplete coho salmon counts because the project operation dates did not span entire run (1991, 1993–1995, 2005–2006, 2012).

[e] Incomplete trout counts due to project operation dates or weir location (1987, 1990-1991, 1993-1995, 2004–2009, 2012, 2013). Cumulative counts from July 1 through end of weir operation.

[f] Source for 1987: Larson et al. (1988); 1988: Larson and Balland (1989); 1989: Larson (1990); 1990: Larson (1991); 1991: Larson (1992); 1992: Larson (1993); 1993: Larson (1994); 1994: Larson (1995); 1995: Larson (1997), when escapement weir was located approximately 1.6 RKM from mouth.

[g] Source for 2003–2004: Kerkvliet et al. (2008); 2005–2006: Kerkvliet and Burwen (2010); 2007–2008: Kerkvliet et al. (2012); 2009: Kerkvliet and Booz (2012). 2010–2012: Kerkvliet and Booz (2018a–d).

-continued-

Table 4.–Page 2 of 2.

[h] All DIDSON images and the associated counts were assumed to be Chinook salmon.

[i] Chinook salmon estimates based on combined DIDSON and weir census. If DIDSON was operated in July, counts were apportioned between large fish (Chinook salmon) and small fish (Dolly Varden and pink salmon).

[j] No counts were collected from 19 to 21 August because the weir washed out due to flooding. The DIDSON was operated again from 22 to 24 August; an estimated 3,292 coho salmon were counted.

Table 5.–Annual Chinook salmon monitoring location and gear by date, 1987–1995 and 2003–2014.

	Mainstem DIDSON			Mainstem weir			North fork weir (RKM 5.5)		South fork weir (RKM 4.1)	
Year	RKM [a]	Start	Stop	RKM [a]	Start	Stop	Start	Stop	Start	Stop
1987 [b]	2.9	–	–	2.9	04 Jul	10 Sep	–	–	–	–
1988 [b]	2.9	–	–	2.9	03 Jul	05 Oct	–	–	–	–
1989 [b]	2.9	–	–	2.9	06 Jul	05 Nov	–	–	–	–
1990 [b]	2.9	–	–	2.9	04 Jul	15 Aug	–	–	–	–
1991 [b]	2.9	–	–	2.9	04 Jul	15 Aug	–	–	–	–
1992 [b]	2.9	–	–	2.9	04 Jul	01 Oct	–	–	–	–
1993 [b]	2.9	–	–	2.9	03 Jul	16 Aug	–	–	–	–
1994 [b]	2.9	–	–	2.9	03 Jul	16 Aug	–	–	–	–
1995 [b]	2.9	–	–	2.9	04 Jul	12 Aug	–	–	–	–
2003 [c]	3.9	30 May	09 Jul	–	–	–	–	–	–	–
2004 [c]	3.9	15 May	08 Jun	3.9	08 Jun	07 Jun	–	–	–	–
2005 [c]	3.9	13 May	03 Jun	3.9	03 Jun	09 Sep	–	–	–	–
2006 [c]	3.9	15 May	13 Jun	3.9	13 Jun	24 Aug	–	–	–	–
2007 [c]	3.9	14 May	07 Jun	3.9	07 Jun	12 Sep	–	–	–	–
2008 [c]	3.9	13 May	16 Jun	3.9	16 Jun	11 Sep	–	–	–	–
2009 [c]	3.9			3.9	12 May	11 Sep	–	–	–	–
2010 [c]	3.9	13 May	08 Jun	3.9	08 Jun	29 Sep	–	–	–	–
2011 [c]	3.9	13 May	24 May	3.9	24 May	21 Sep	–	–	–	–
2012 [c]	3.9	14 May	13 Jun	3.9	13 Jun	03 Aug	–	–	–	–
2013 [c,d]	3.9	19 May	19 Jun	–	–	–	19 Jun	03 Aug	19 Jun	03 Aug
2014	–	–	–	–	–	–	07 May	03 Aug	14 May	03 Aug

Note: En dash indicates location was not monitored by the means described in the column.

[a] Mainstem escapement monitoring sites at RKM 1.6 and RKM 2.8 were remeasured in 2013 to RKM 2.9 and RKM 3.9, respectively.

[b] Source: Larson et al. (1988); Larson and Balland (1989); Larson (1990–1995, 1997) when the escapement weir was located approximately 2.9 RKM from the mouth.

[c] Source: Kerkvliet et al. (2008, 2012); Kerkvliet and Burwen (2010); Kerkvliet and Booz (2012); Kerkvliet and Booz (2018 a–d).

[d] Site used from 2003 to 2012 were unsuitable for monitoring due to high flows. In 2013, a DIDSON was operated at RKM 3.7 downstream of the RKM 3.9 mainstem site. Once flows allowed weir installation, monitoring was relocated and split into 2 sites upstream of the mainstem site at RKM 3.0. A resistance board weir was used to monitor escapement at RKM 4.1 on the south fork and a fixed picket weir used at RKM 5.5 on the north fork.

Table 6.–Fish counts by species for Anchor River mainstem DIDSON and north and south fork weirs, 2013–2014.

			Fish counts						
Year	Location	RKM [a]	Chinook salmon [b]	Dolly Varden [c]	Pink salmon [c]	Chum salmon	Sockeye salmon	Coho salmon [d]	Rainbow trout, steelhead [d,e]
2013 [f]	North fork	5.5	586	537	193	5	2	1	0
	South fork	4.1	1,577	986	757	22	4	0	0
	Mainstem	4.0	2,238	NA	NA	NA	NA	NA	NA
	Total		4,401	1,523	950	27	6	1	0
2014	North fork	5.5	1,338	680	59	4	2	21	3
	South fork	4.1	1,161	5,924	105	2	1	34	1
	Total		2,499	6,604	164	6	3	55	4

Note: NA means not applicable to mainstem DIDSON.

[a] River kilometers (RKM).

[b] All DIDSON images and the associated counts were assumed to be Chinook salmon.

[c] Incomplete Dolly Varden and pink salmon counts because smaller sized Dolly Varden and pink salmon were able to go between the weir pickets undetected.

[d] Incomplete coho salmon and steelhead counts because project operation dates did not encompass the entire run.

[e] Cumulative counts from July 1 through end of weir operation.

[f] Site used from 2003 to 2012 unsuitable for monitoring due to high flows. In 2013, DIDSON operated at RKM 3.7 downstream of the RKM 4.0 mainstem site. Once flows allowed weir installation, monitoring was relocated and split into 2 sites upstream of the mainstem site at RKM 4.0. A resistance board weir was used to monitor escapement at RKM 4.1 on the south fork and a fixed picket weir used at RKM 5.5 on the north fork.

Table 7.–Estimated ocean age, sex, and length (mid eye to tail fork, METF) composition of Anchor River Chinook salmon escapement, 2014.

		Composition of beach seine samples by ocean age [a]					Composition by sex	
Sex		1	2	3	4	Total	Beach seine [a]	Video [b]
Female								
	Number of samples	0	1	66	18	85	93	615
	Estimated percent	NA	0.4	24.7	6.7	NA	30.9	24.9
	SE percent	NA	0.4	2.6	1.5	NA	2.7	0.9
	Estimated abundance	NA	10	617	167	772	NA	622
	SE abundance	NA	10	65	37	67	NA	22
	Length samples	NA	1	66	18	93	NA	NA
	Mean length (mm)	NA	705	772	834	782	NA	NA
	SE mean length	NA	NA	5	12	6	NA	NA
Male								
	Number of samples	35	96	42	9	182	208	1,858
	Estimated percent	13.1	36.0	15.7	3.4	NA	69.1	75.1
	SE percent	2.1	2.9	2.2	1.1	NA	2.7	0.9
	Estimated abundance	327	900	392	85	1,727	NA	1,877
	SE abundance	52	72	55	27	67	NA	22
	Length samples	35	94	41	8	204	NA	NA
	Mean length (mm)	345	598	765	876	598	NA	NA
	SE mean length	5	6	9	9	11	NA	NA
All								
	Number of samples	35	97	108	27	267	301	2,473
	Estimated percent	13.1	36.3	40.4	10.1	NA	100.0	NA
	SE percent	2.1	2.9	3.0	1.8	NA	0.1	NA
	Estimated abundance	327	907	1,010	252	2,499	NA	NA
	SE abundance	52	72	75	45	1	NA	NA
	Length samples	35	95	107	26	297	NA	NA
	Mean length (mm)	345	599	769	847	655	NA	NA
	SE mean length	5	6	5	10	9	NA	NA

Note: NA means not applicable.

[a] Age, sex, and length-at-age compositions based on samples collected between RKM 3.7 to RKM 1.7 from Chinook salmon captured in beach seines.

[b] Sex composition based on Chinook salmon examined at video weirs at RKM 5.5 and RKM 4.1.

Table 8.–Species composition of beach seine catches from the mainstem Anchor River, 2014.

Sample date	Chinook salmon	Dolly Varden	Pink salmon	Steelhead
15 May	2	0	0	1
21 May	11	0	0	11
29 May	24	0	0	17
04 Jun	29	7	0	0
12 Jun	84	2	0	0
18 Jun	21	1	0	0
25 Jun	47	4	0	0
03 Jul	66	10	2	0
11 Jul	18	80	13	0
Total	302	104	15	29

Table 9.–Anchor River Chinook salmon estimated escapement and freshwater harvest by ocean-age composition, 2003–2014.

	Escapement										Freshwater harvest (number of fish)					
			Percent by ocean age				Number of fish by ocean age						Ocean age			
Run year	Estimate	SE	1	2	3	4	1	2	3	4	Estimate	SE	1	2	3	4
2003[a]	9,238	0	5	23	58	14	471	2,125	5,340	1,275	1,011	157	52	233	584	140
2004	12,016	283	9	21	49	22	1,057	2,487	5,840	2,632	1,561	198	137	323	759	342
2005	11,156	229	5	24	52	19	558	2,666	5,823	2,108	1,432	233	72	342	748	271
2006	8,945	289	6	17	52	25	572	1,476	4,660	2,236	1,394	197	89	230	726	349
2007	9,622	238	1	22	53	24	48	2,116	5,138	2,319	2,081	326	10	458	1,111	502
2008	5,806	169	4	22	69	5	255	1,266	3,977	302	1,612	241	71	351	1,104	84
2009	3,455	0	8	51	37	4	269	1,766	1,268	152	737	212	57	377	270	32
2010	4,449	103	7	36	51	6	311	1,606	2,282	249	364	118	25	131	187	20
2011	3,545	0	3	50	41	6	113	1,773	1,457	202	573	163	18	287	236	33
2012	4,509	100	11	34	50	5	487	1,547	2,273	203	38	23	4	13	19	2
2013	4,401	117	20	31	44	5	880	1,364	1,936	220	97	55	20	30	42	5
2014	2,499	0	14	37	41	9	339	914	1,018	227	203	74	28	74	83	18
Average 2003–2013	6,635	127	8	31	50	12	448	1,760	3,416	1,009	925	175	49	237	489	150

[a] Escapement was not fully assessed due to operation dates.

Table 10.–Anchor River Chinook salmon return per spawner by brood year, 2003–2014.

	Number of fish returning by brood year			
Brood year	Escapement	Freshwater harvest	Total return	Return per spawner
2003	6,817	1,684	8,501	0.92 [a]
2004	2,831	653	3,484	0.29
2005	4,505	667	5,172	0.46
2006	3,535	426	3,961	0.44
2007	4,577	336	4,912	0.51
2008	3,823	92	3,916	0.67
2009	NA	NA	NA	NA
2010	NA	NA	NA	NA
2011	NA	NA	NA	NA
2012	NA	NA	NA	NA
2013	NA	NA	NA	NA
2014	NA	NA	NA	NA
Average 2003–2013	4,342	643	4,985	0.55

Note: "NA" means not available.

[a] Biased high because escapement was not fully assessed.

FIGURES

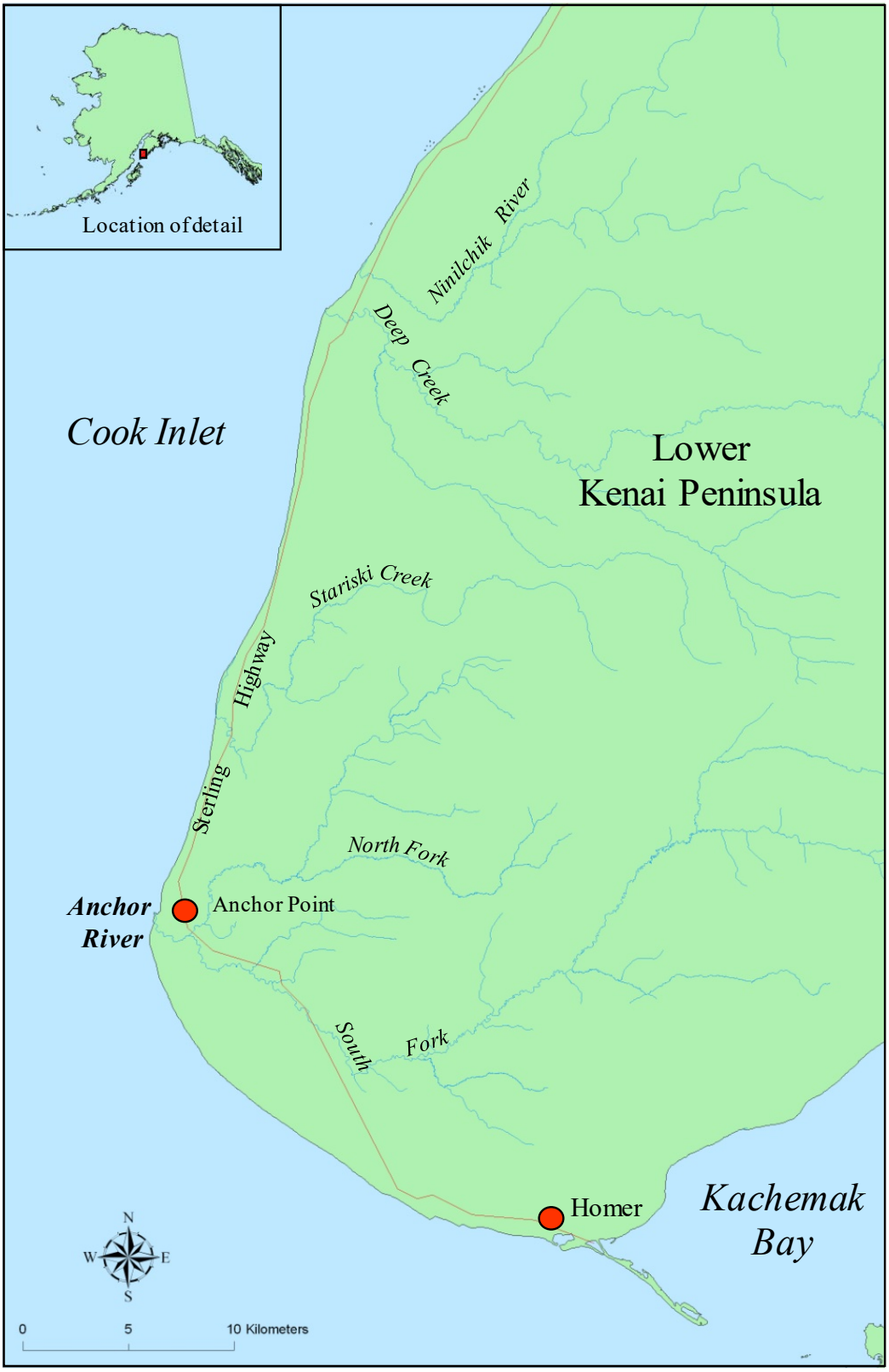

Figure 1.–Location of Anchor River and other roadside tributaries in the Lower Cook Inlet Management Area.

Figure 2.–View of the south fork weir site and its relative location to the 2003–2012 mainstem DIDSON–weir site and the 2013–2014 Bridge Hole DIDSON site.

Figure 3.–Location of the south and north fork Chinook salmon escapement monitoring weir sites in 2013 and 2014, Anchor River.

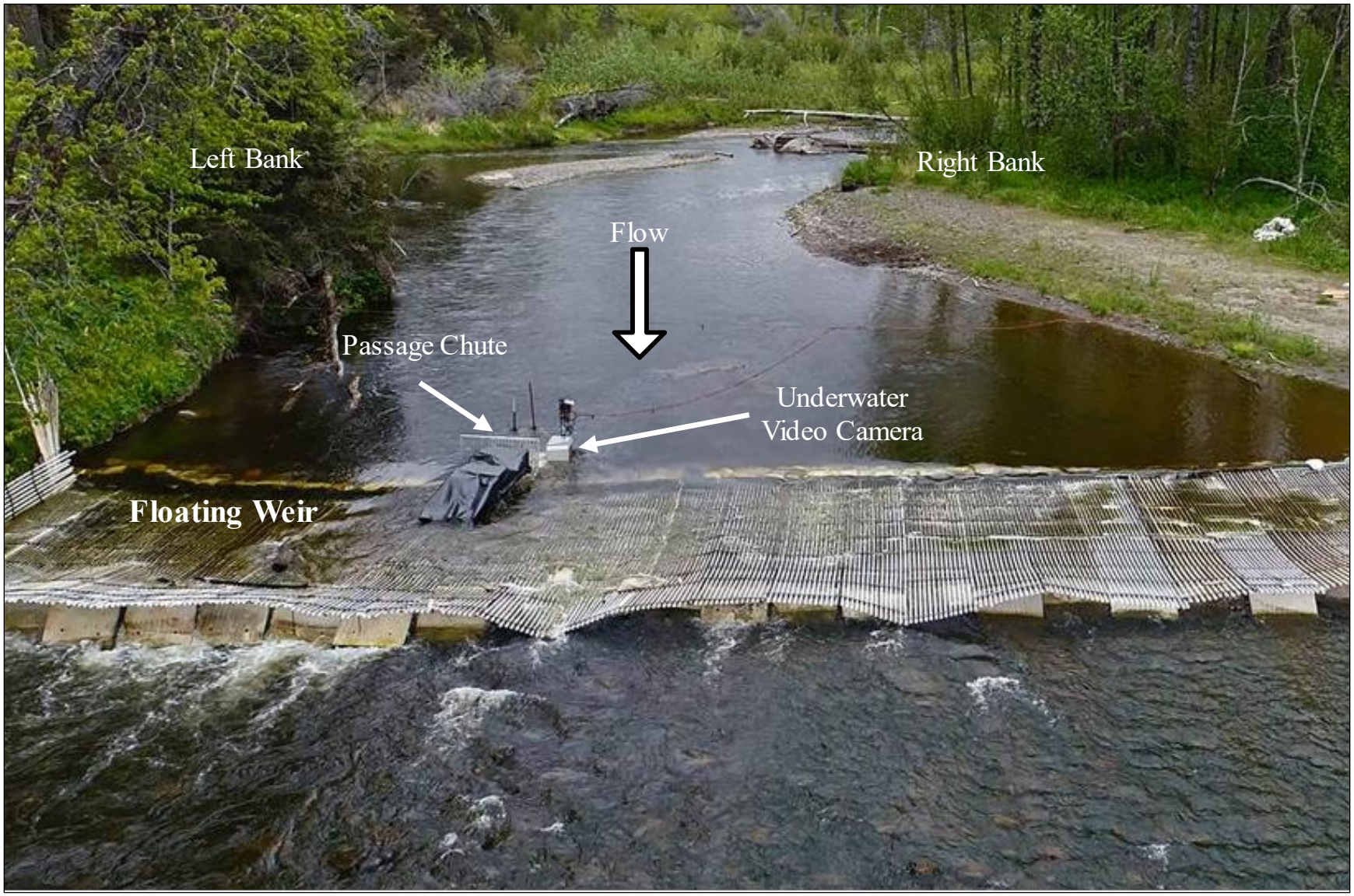

Figure 4.–Resistance board weir on the south fork of the Anchor River, 2014.

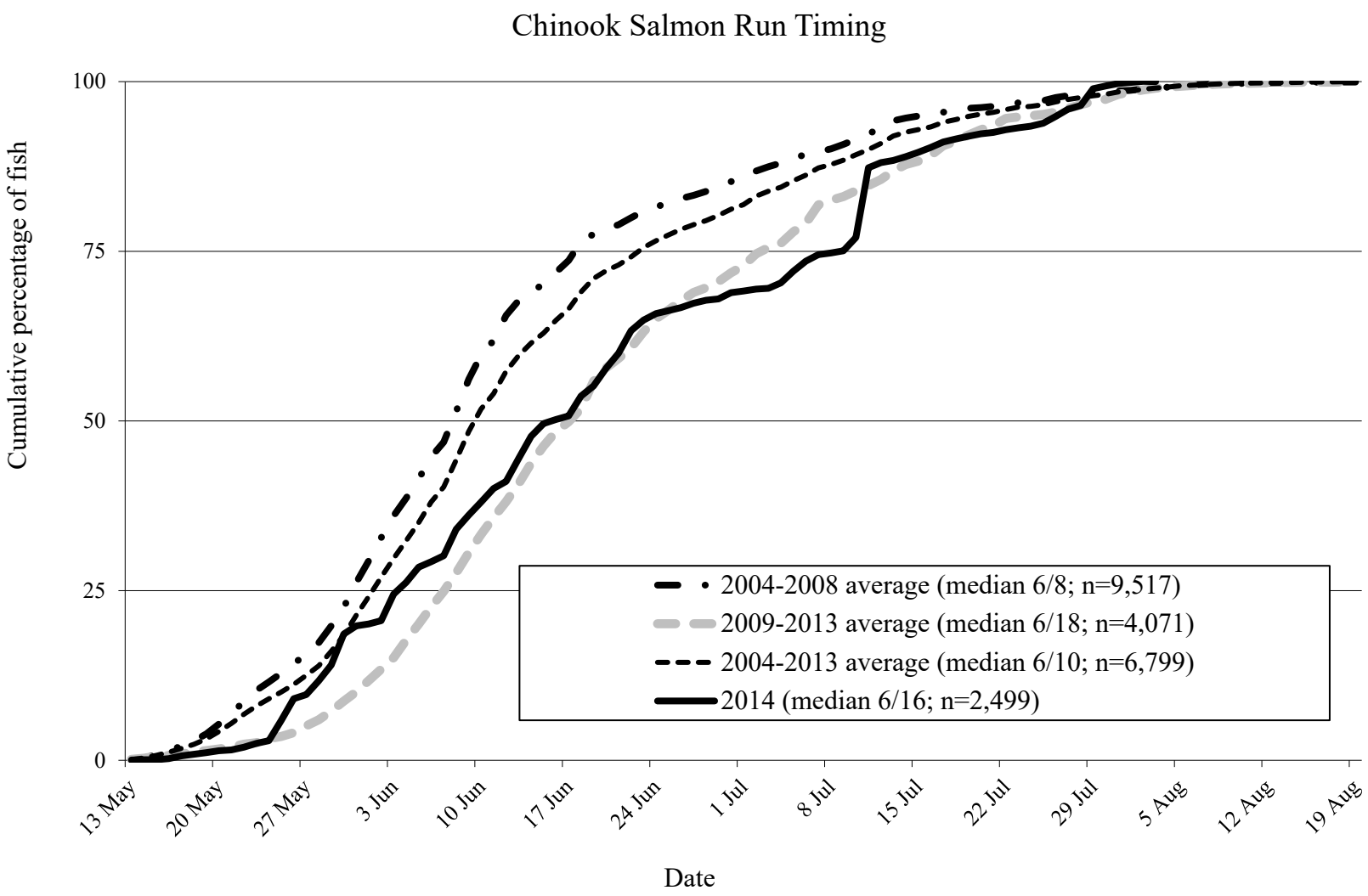

Figure 5.–Chinook salmon combined north and south forks run timing for 2014 and the 2004–2008, 2009–2013, and 2004–2013 averages, Anchor River.

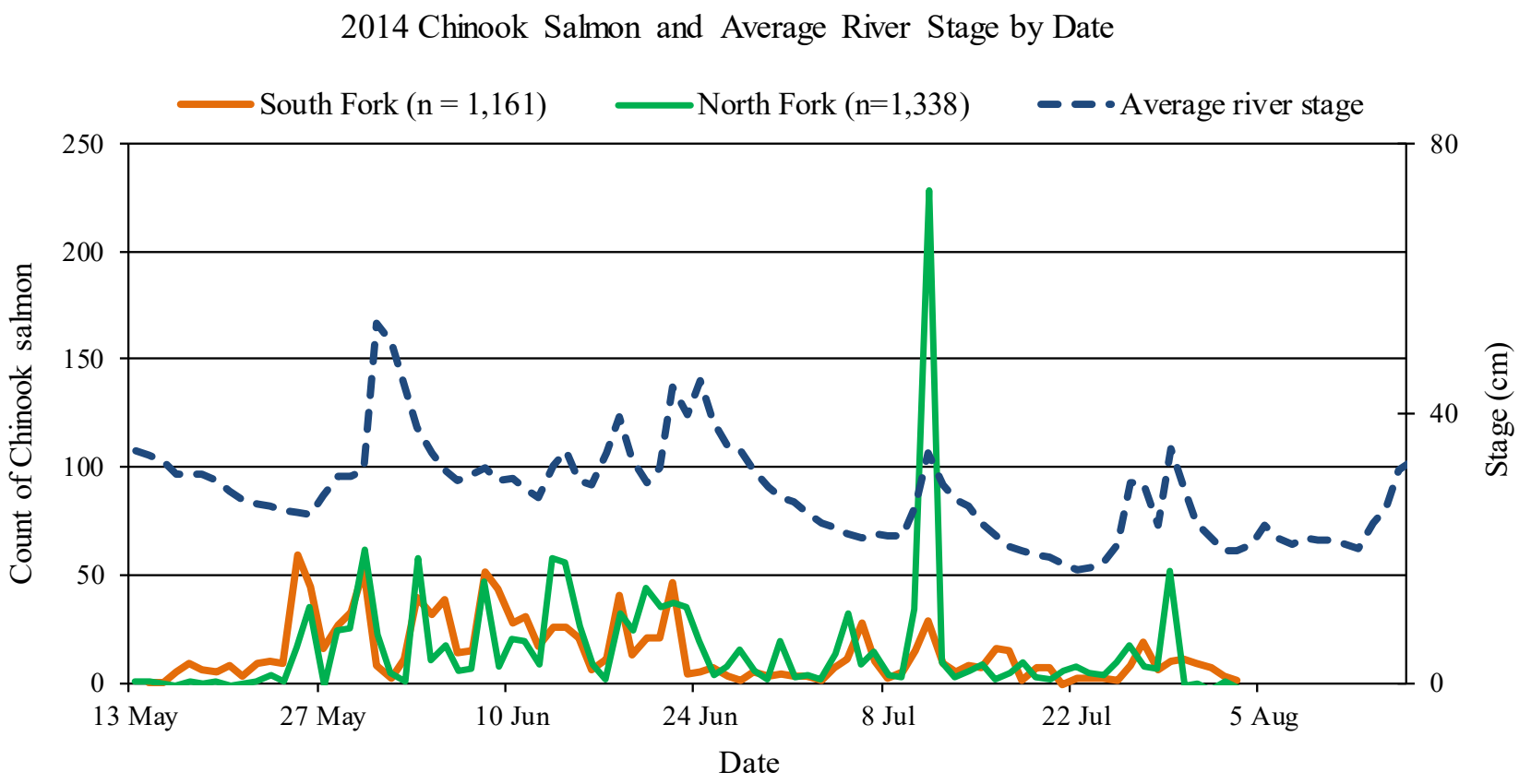

Figure 6.–Daily counts of Chinook salmon at the north and south fork sonar–weir sites plotted against daily river stage averages, Anchor River, 2014.

Note: River stage gauge located on south fork at approximately 11.4 RKM.

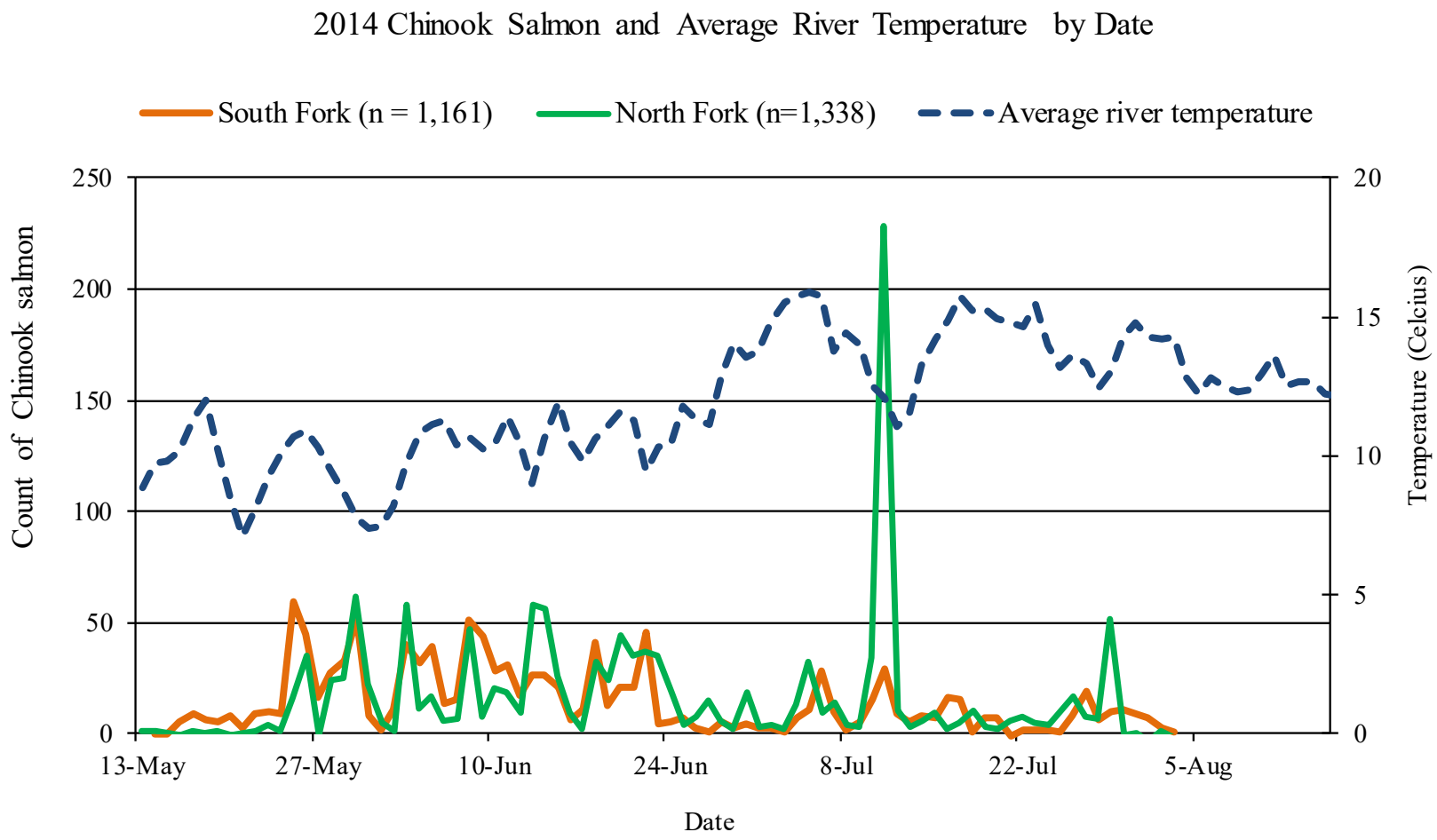

Figure 7.–Daily counts of Chinook salmon at the north and south forks weir sites plotted against daily river temperature averages, Anchor River, 2014.

Note: River temperature collected by Sue Mauger of Cook Inlet Keeper 0.1 RKM downstream of the south fork resistance board weir.

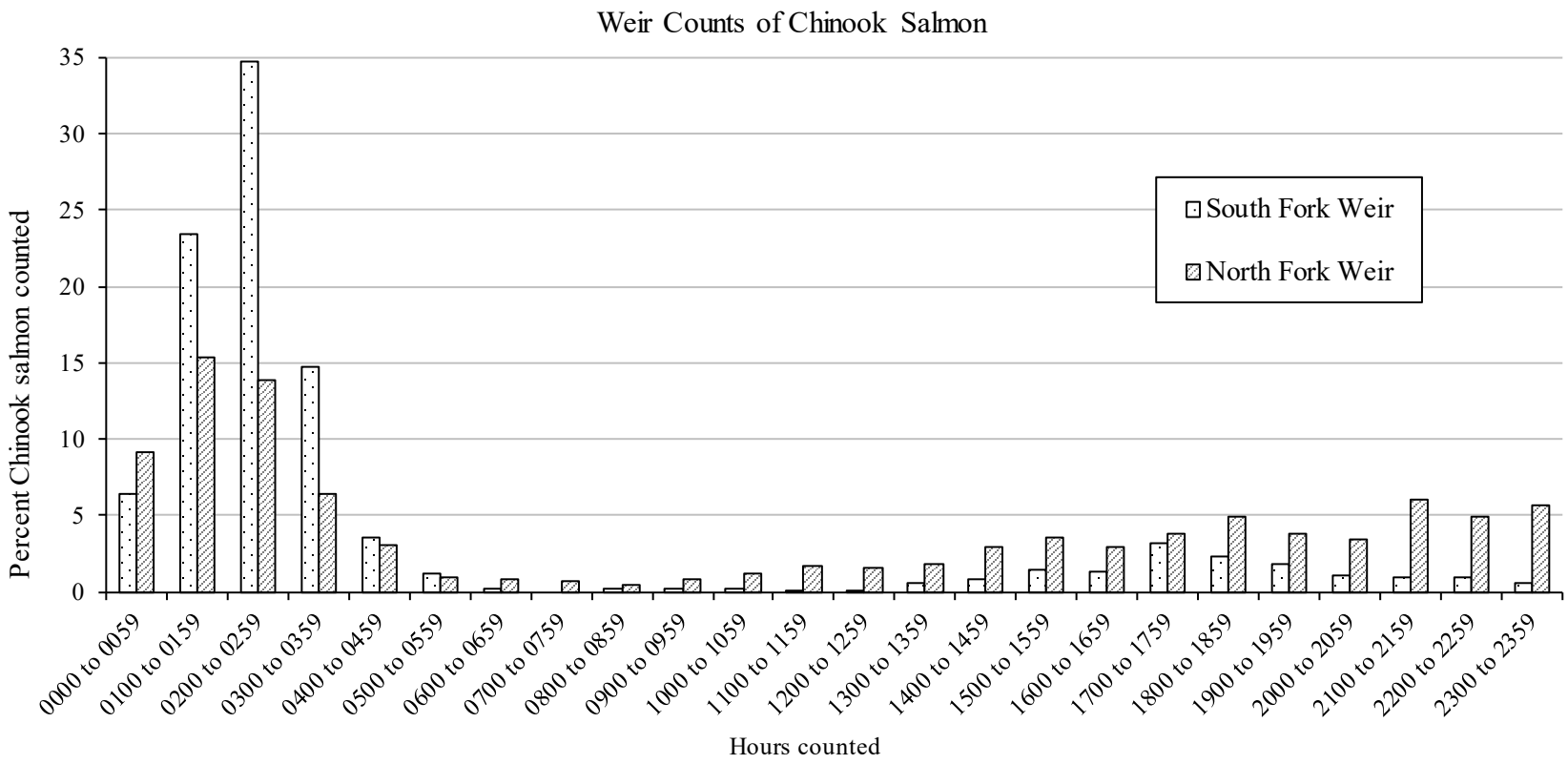

Figure 8.–Percentages of Chinook salmon counted by hour moving upstream through the south and north fork video weirs from 13 June through 3 August 2014.

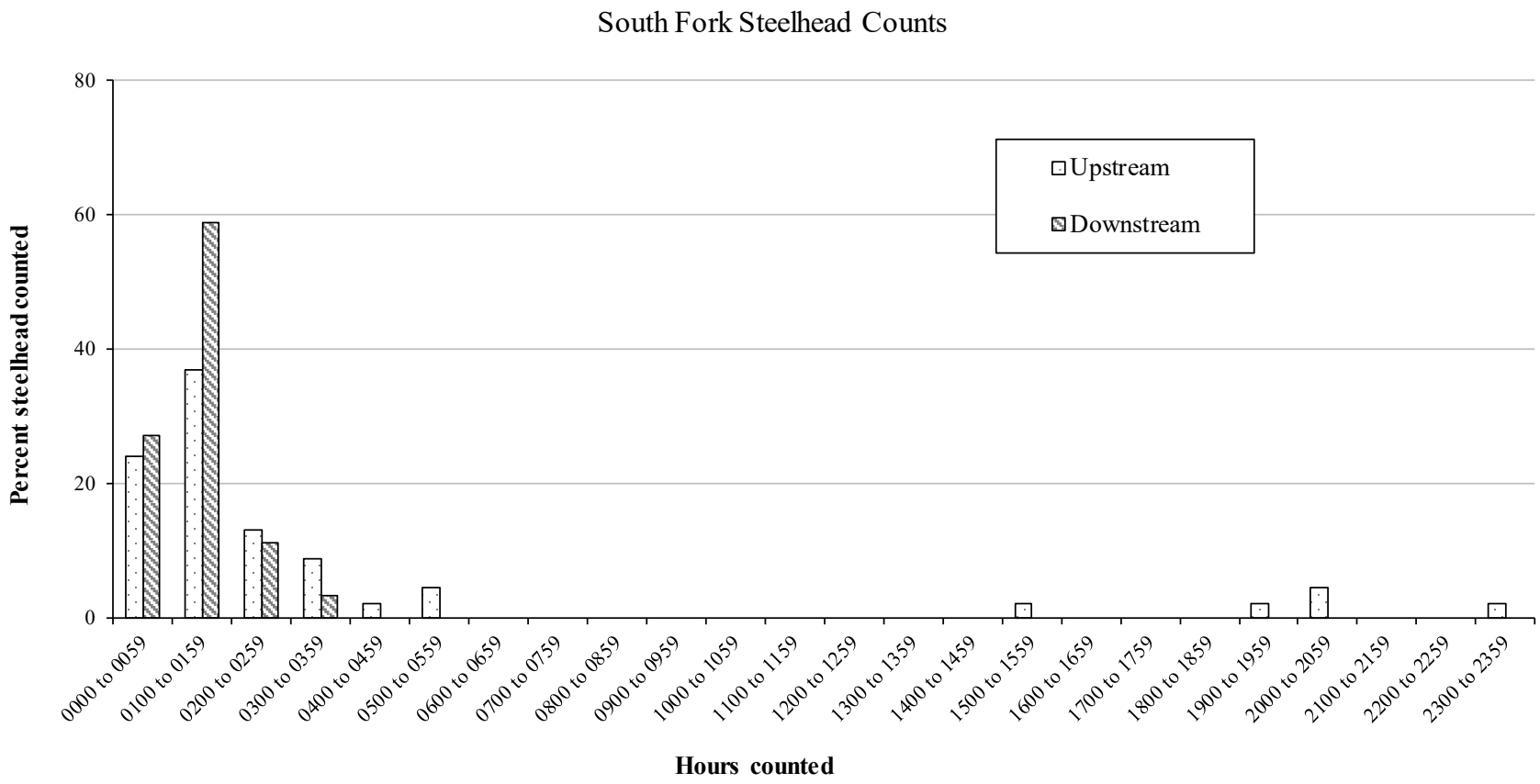

Figure 9.–Percent of steelhead counted by hour upstream and downstream though the south fork video boxes from 13 June through 3 August 2014.

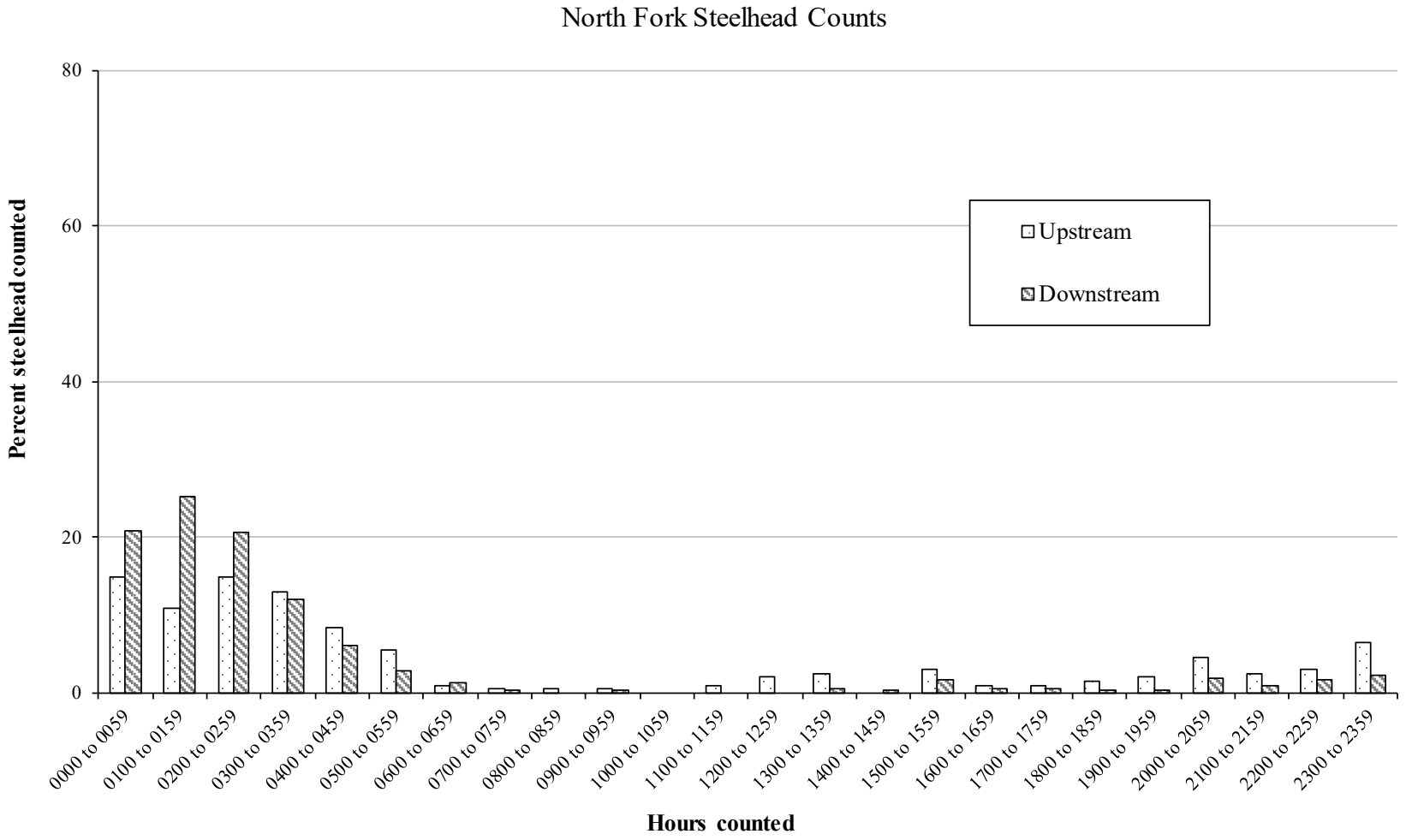

Figure 10.–Percent of steelhead counted by hour upstream and downstream through the north fork video boxes through 3 August 2014.

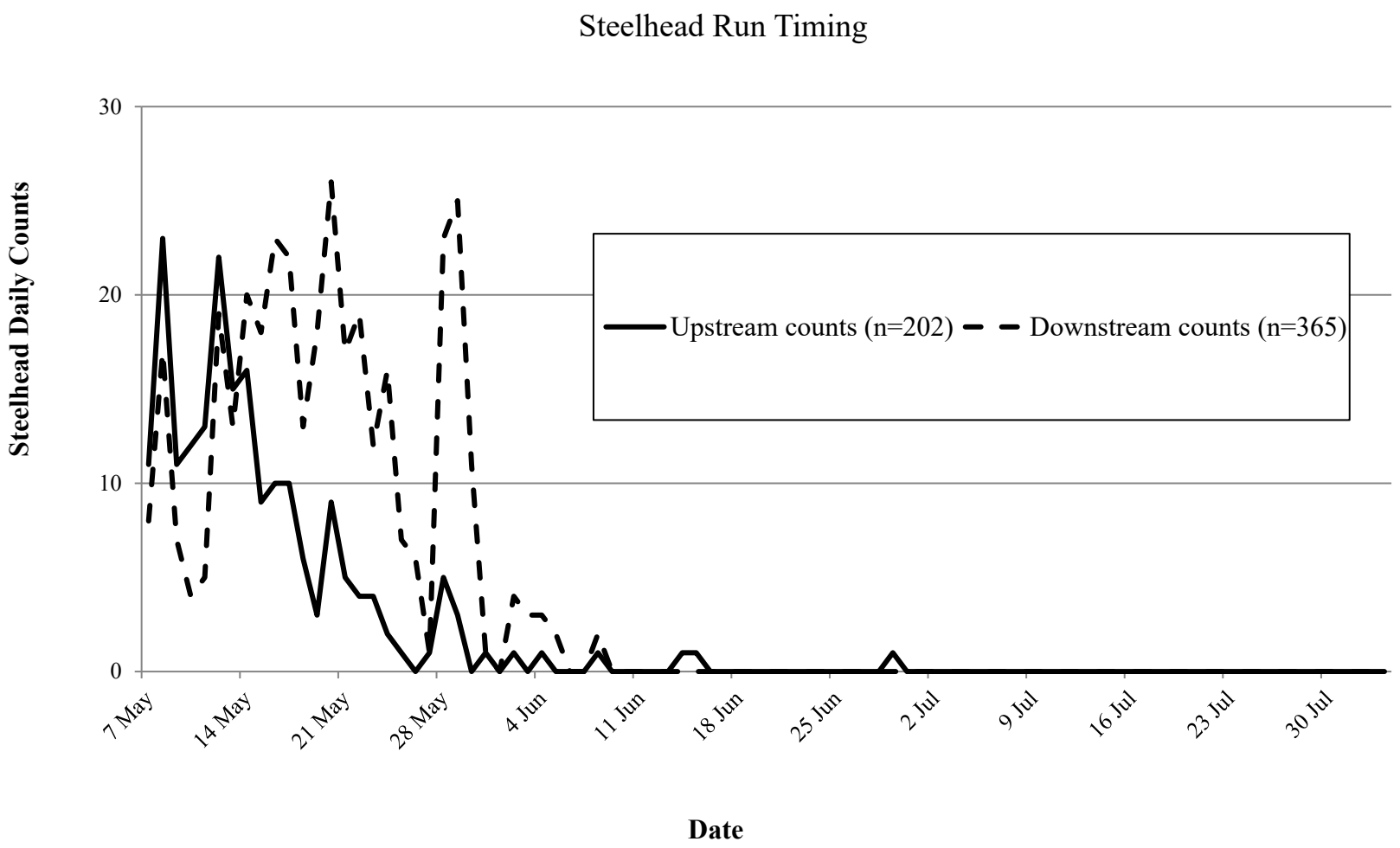

Figure 11.–Steelhead run timing at the north fork Anchor River (RKM 5.3), 2014.

APPENDIX A: MONITORING, ESCAPEMENT GOAL, AND REGULATION TIMELINES FOR ANCHOR RIVER CHINOOK SALMON

Appendix A1.–Timeline of escapement monitoring for Chinook salmon on the Anchor River, 1950–2014.

Year(s)	Escapement monitoring
1950s	Periodic fisheries investigations in the Anchor River were conducted by U.S. Fish and Wildlife Service. Chinook salmon escapement was monitored with weirs at various lower river locations on the north and south forks and the mainstem. Aerial and foot surveys were also conducted.
1962–1969	Annual Chinook salmon escapement was estimated with a combination aerial and ground index survey. Surveys were conducted once annually over a standard length of river. Aerial surveys were done from a fixed-wing aircraft (Super Cub). Foot surveys were conducted within a subsection of the aerial survey from the Sterling Highway Bridge upstream approximately 4 river kilometers (RKM) to forks (assumed to be the confluence). Where the foot survey was conducted, if the foot survey counts were greater than the aerial counts, the total aerial count was expanded by the difference. In 1966, no aerial surveys were conducted due to poor viewing conditions. Note: "standard length" and the location of the Sterling Highway Bridge (old versus new) could not be determined.
1970–1974	The ground index subsection was expanded to approximately 8 RKM from Glanville Lumber to forks. No aerial survey was conducted in 1970 or 1971. Note: "forks" is assumed to be the north and south forks confluence.
1975–1982	Aerial surveys were conducted using rotary-wing aircraft to index Chinook salmon escapement. Surveys were conducted once annually over a standard section of the south fork of the Anchor River. Foot surveys continued as before. Note: "forks" is assumed to be the north and south forks confluence.
1983–1994	The index subsection for combined aerial and foot surveys was reduced back to approximately 4 RKM from Sterling Highway Bridge to forks. Note: "standard length" and the location of the Sterling Highway Bridge (old versus new) could not be determined.
1995–2002	The foot survey was discontinued. Periodic foot surveys were conducted over additional stream reaches such as North Fork, Beaver Creek, and above forks. Aerial surveys continued.
2003	In addition to the aerial survey, the feasibility of using DIDSON[1] as an escapement monitoring tool was tested on the mainstem of the Anchor River just below the confluence of the north and south forks at RKM 2.8[2]. DIDSON was only operated from 30 May through 9 July, not over the entire run.
2004	Chinook salmon escapement was monitored over the entire run at approximately RKM 2.8 through a combination of DIDSON during periods of high water and resistance board weir during periods of low water. A weir was operated on the north fork to monitor the entire run at approximately RKM 6.2. Aerial surveys of the north fork and south fork index areas were used to compare index to total escapement estimates.
2005–2008	Chinook salmon escapement was monitored over the entire run at approximately RKM 2.8 through a combination of DIDSON during periods of high water and resistance board weir during periods of low water. Aerial surveys were continued through 2008 to compare index to total run estimates.
2009	Chinook salmon escapement was censused using a resistance board weir over the entire run at approximately RKM 2.8 because of low water levels. A foot survey of the historical index area was conducted from the new Sterling Highway Bridge (lat 59.746895, long −151.754319) to the confluence of the North and South Forks (lat 59.772253, long −151.834263).

-continued-

[1] Dual-frequency identification sonar (DIDSON).

[2] River kilometer 2.8 for the mainstem site was remeasured in 2013 to RKM 4.0.

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Year(s)	Escapement monitoring
2010	Chinook salmon escapement was monitored over the entire run at approximately RKM 2.8 through a combination of DIDSON during periods of high water and resistance board weir during periods of low water. Escapement monitoring in August and September was conducted through a cooperative agreement with USFWS. USFWS monitored escapement using the resistance board weir and an underwater video camera (Anderson and Stillwater Sciences 2011).
2011–2012	Chinook salmon escapement was monitored over the entire run at approximately RKM 2.8 through a combination of DIDSON during periods of high water and resistance board weir fitted with an underwater video camera during periods of low water. In 2011, escapement monitoring in August and September was conducted through a cooperative agreement with USFWS.
2013	Chinook salmon escapement was monitored over the entire run; however, high river flows changed the channel morphology at the RKM 2.8[3] mainstem site used from 2003 to 2012. During the early high flows, DIDSON was used about 0.3 RKM downstream of the mainstem site at Bridge Hole. Once flows subsided, new weir sites were identified upstream on the north fork at RKM 5.5 and the south fork at RKM 4.1.
2014	Chinook salmon escapement was monitored over the entire run using a fixed picket weir on the north fork at RKM 5.5 and resistance board weir on the south fork at RKM 4.1.

[3] River kilometer 2.8 for the mainstem site was remeasured in 2013 to RKM 4.0.

Appendix A2.–Timeline of sport harvest monitoring and escapement goals for Chinook salmon on the Anchor River, 1950–2014

Year (s)	Sport harvest assessment
1950s	Periodic fisheries investigations in the Anchor River were conducted by U.S. Fish and Wildlife Service. Chinook salmon harvest was monitored through creel surveys.
1966–1977	Punch cards were used to enforce daily and seasonal limits (Hammarstrom et al. 1985).
1971–1977	Punch card returns were the primary source of harvest data. Effort was estimated by car counts each day at campgrounds and parking areas from 1971 to 1976.
1972–1986	Creel surveys were conducted at the Deep Creek access from 1972 to1986 and 1994 (Nelson 1994, 1995). A creel survey at the Anchor River–Whiskey Gulch access was conducted in 1986 (Nelson 1994).
1976–1983	Age composition of the Chinook salmon harvest was estimated for the Anchor River, Deep Creek, and Ninilchik River (Hammarstrom et al. 1985).
1977 to present	Statewide Harvest Surveys (SWHS) were conducted and produced annual estimates of total catch and harvest for Chinook salmon in the Anchor River.
Year (s)	Escapement goals
1993–1997	The first biological escapement goal (BEG) of 1,790 Chinook salmon was adopted in 1993. The BEG was the average of the expanded estimates from aerial and foot survey index counts conducted from 1966 to 1969 and from 1972 to 1991.
1998–2000	In 1998, the BEG was rescaled to a range of 1,050–2,200 Chinook salmon and was based on historical aerial survey counts and their relationship to sport harvest. The escapement range was approximated with a median aerial survey count of 1,211 Chinook salmon. The upper end of the range was the value that 20% of the annual aerial counts were above. The lower end was the value that 40% of the annual aerial counts were below (Szarzi and Begich 2004: page 22).
2001–2004	In 2001, the sustainable escapement goal (SEG) of 750 to 1500 Chinook salmon was adopted. The SEG was the 25th and 75th percentiles of the annual aerial counts from 1976 through 2000 (Szarzi and Begich 2004: page 22). During the Alaska Board of Fisheries (BOF) meeting in February 1999, in response to the guidelines established in the *Sustainable Salmon Fisheries Policy*, BOF designated Anchor River Chinook salmon as a stock of "management concern" defined in the policy as "a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, [optimal escapement goal] OEG, or other specified management objectives for the fishery" (5 AAC 39.222 [f] [21]) (Szarzi and Begich 2004: page 25).
2005–2007	In 2005, the SEG was repealed and no new goal was adopted in anticipation that SF would collect sufficient escapement data with the DIDSON–weir project to recommend an escapement goal (Szarzi et al. 2007).
Year (s)	Escapement goals
2008	ADF&G adopted a lower bound SEG of 5,000 Chinook salmon. The SEG was based on a full probability spawner-recruit model that incorporated aerial survey data and SWHS harvest estimates from 1977 to 2007, and the total escapement estimates and age composition data collected from the DIDSON–weir project from 2003 to 2007 (Szarzi et al. 2007).
2010–2014	ADF&G adopted an SEG range of 3,800–10,000 Chinook salmon. The SEG was based on a full probability spawner–recruit model and was updated with escapement and harvest data through 2009. The lower bound of the SEG is the point estimate of SMSY The upper bound is the estimated point of carrying capacity (Otis et al. 2010).

Appendix A3.–Timeline of the freshwater fishing regulations and emergency orders (EOs) for Chinook salmon on the Anchor River, 1960–2014

Closed areas for Chinook salmon	
Year	Chinook salmon fishing regulations
1960–2010	Salmon fishing closed upstream of the confluence of the north and south forks.
1996–2013	The area above "forks" was closed to all fishing until August 1 to protect spawning salmon.
Recording requirements	
Year	Chinook salmon fishing regulations
1966–1980	A Chinook salmon punch card was required by all anglers, including those under 16 years of age.
1980–2013	Anglers recorded Chinook salmon harvest on the back of a sport fishing license or harvest card.
Open season for Chinook salmon by regulation	
Year	Chinook salmon fishing regulations
1960	May 7 to December 31.
1961	May 7 to July 1 only.
1962–1963	May 7 to July 8 only.
1964–1965	Closed.
1966	May 28–June 26 and limited to weekends and holidays or until 500 Chinook salmon 20 inches (in) or longer was attained among the Anchor River, Deep Creek, Ninilchik and Kenai Rivers.
1967	May 27–June 11 opened continuously or until 500 Chinook salmon 20 in or longer was attained among the Anchor River, Deep Creek, Ninilchik and Kenai Rivers.
1968	May 25–June 9 opened continuously or until 500 Chinook salmon 20 in or longer was attained among the Anchor River, Deep Creek, Ninilchik and Kenai Rivers. .
1969	May 24–June 8 opened continuously or until 200 Chinook salmon 20 in or longer was attained among the Anchor River, Deep Creek, Ninilchik and Kenai Rivers.
1970	May 30–June14 opened continuously or until 200 Chinook salmon 20 in or longer was attained among the Anchor River, Deep Creek, Ninilchik and Kenai Rivers.
1971	Beginning on the Memorial Day weekend for 2 consecutive 2-day weekends (Saturday and Sunday). Quota eliminated.
1972	Beginning on the Memorial Day weekend for 2 consecutive 2-day weekends.
1973–1975	Beginning on the Memorial Day weekend for 3 consecutive 2-day weekends.
1976–1977	Beginning on the Memorial Day weekend for 4 consecutive 2-day weekends.
1978–1988	Beginning on the Memorial Day weekend for 4 consecutive 3-day weekends (weekends include Monday).
1989–2001	Beginning on the Memorial Day weekend for 5 consecutive 3-day weekends (weekends include Monday).
2002–2004	Beginning on the Memorial Day weekend for 4 consecutive 3-day weekends (weekends include Monday).
2005–2007	Beginning on the 3-day weekend before the Memorial Day weekend and for 4 consecutive 3-day weekends.
2008–2014	Beginning on the 3-day weekend before the Memorial Day weekend and for 4 consecutive 3-day weekends and also the Wednesdays following each weekend opening.

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Bag, possession, and season limits	
Year	Chinook salmon fishing regulations
1960	Bag and possession limit: 3 salmon over 16 inches in length, of which not more than 2 could be Chinook salmon 20 inches or more in length.
1961–1962	Bag and possession limit: 3 salmon over 20 inches in length, of which not more than 1 could be Chinook salmon 20 inches or more in length.
1963	Bag and possession limit: salmon 16 inches or more in length; 6 coho salmon; 3 pink, chum or sockeye salmon; or 1 Chinook salmon.
1964–1965	Closed.
1966–1978	Bag and possession limit: 1 Chinook salmon 20 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 20 inches long. Season limit: 2 Chinook salmon 20 inches or more in length.
1979–1985	Bag and possession limit: 1 Chinook salmon 20 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 20 inches long. Season limit: 5 Chinook salmon 20 inches or more in length.
1986–1995	Bag limit: 1 Chinook salmon 16 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 16 inches long. Season limit: 5 Chinook salmon 16 inches or more in length.
1996–1998	Bag limit: 1 Chinook salmon 16 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 16 inches long. Season limit: 2 Chinook salmon 16 inches or more in length from Deep Creek or the Anchor River combined. After harvesting a Chinook salmon 16 inches or more in length from Deep Creek or the Anchor River, an angler may not fish in either drainage for the rest of that day.
1996–1998	Bag limit: 1 Chinook salmon 16 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 16 inches long. Season limit: 2 Chinook salmon 16 inches or more in length from Deep Creek or the Anchor River combined. After harvesting a Chinook salmon 16 inches or more in length from Deep Creek or the Anchor River, an angler may not fish in either drainage for the rest of that day.
1999–2007	Bag limit: 1 Chinook salmon 20 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 20 inches long. Season limit: 2 Chinook salmon 20 inches or more in length from Deep Creek or the Anchor River combined. After harvesting a Chinook salmon 20 inches or more in length from Deep Creek or the Anchor River an angler may not fish in either drainage for the rest of that day.
2008–2010	Bag limit: 1 Chinook salmon 20 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 20 inches length. Season limit: 5 Chinook salmon 20 inches or more in length.
2011–2013	Bag limit: 1 Chinook salmon 20 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 20 in length. Season limit: 2 Chinook salmon 20 inches or more in length from Deep Creek or the Anchor River combined. After harvesting a Chinook salmon 20 inches or more in length from Deep Creek or the Anchor River an angler may not fish in either drainage for the rest of that day.

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Bag, possession, and season limits	
Year	Chinook salmon fishing regulations
2014	Bag limit: 1 Chinook salmon 20 inches or more in length. Bag and possession limit: 10 Chinook salmon less than 20 inches long. Season limit: 2 Chinook salmon 20 inches or more in length from Deep Creek or the Anchor River combined. After harvesting a Chinook salmon 20 inches or more in length from the Anchor River an angler may not fish in either the Anchor River, Deep Creek, or the Ninilchik River for the rest of that day.

Emergency orders (EOs)	
Year	Chinook salmon fishing regulations
1971	EO extended the Chinook salmon fishery on Anchor River and Deep Creek an additional 2-day weekend due to low catches (Nelson 1972).
1972	EO extended the Chinook salmon fishery on Anchor River and Deep Creek an additional 2-day weekend due to low catches (Nelson 1972).
1988	EO 2-KS-1-04-88 extended the Chinook salmon fishery on Anchor River and Deep Creek an additional weekend. Highly turbid river conditions early in the season depressed angler success rates and managers' expectations (D. C. Nelson, unpublished[1]).
2004	EO 2-KS-7-07-04 opened the Anchor River Chinook salmon fishery from 12:00 AM on Saturday, June 26 through 11:59 PM on June 28 from the mouth of the Anchor River to 600 ft downstream of the confluence of the north and south forks. Bag limit: 1 Chinook salmon per day.
2009	EO 2-KS-7-08-09 closed the Anchor River drainage from its mouth upstream to the north and south forks to fishing and increased the closed area in the salt waters of Cook Inlet at the mouth of the Anchor River from 2 miles to 4 miles beginning 12:01 AM on Saturday, June 6 through 11:59 PM on Tuesday, June 30.
2010	EO 2-KS-7-10-10 prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages and increased the closed area in the salt waters of Cook Inlet at the mouth of the Anchor River from 1 to 2 miles north and south of the Anchor River mouth and 1 mile offshore beginning 12:01 AM on Saturday, June 5 through 11:59 PM on Wednesday, June 30. EO 2-KS-7-15-10 prohibited the retention of Chinook salmon in the Anchor River drainage from its mouth upstream to the junction of the north and south forks beginning 12:01AM on Saturday, June 12 through 11:59 PM on Wednesday, June 30. Chinook salmon may not be possessed or retained; Chinook salmon caught may not be removed from the water and must be released immediately. EO 2-KS-7-10-10 which prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages remained in effect. EO 2-KS-7-28-10 closed the salt waters of Cook Inlet at the mouth of the Anchor River to all sport fishing from 2 miles north and south of the Anchor River mouth and 1 mile offshore beginning 12:01 AM on Thursday, July 1 through 11:59 PM on Saturday, July 31. EO 2-KS-7-36-10 rescinded EO 2-KS-7-28-10 issued June 29. Effective 12:01 AM on Tuesday, July 13, the salt waters of Cook Inlet at the mouth of the Anchor River from 2 miles north and south of the Anchor River mouth and 1 mile offshore were open to all sport fishing.

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[1] Nelson, D. C. *Unpublished*. A review of Alaska's Kenai Peninsula east side beach recreational razor clam (*Siliqua patula*, Dixon) fishery, 1965-1980. Alaska Department of Fish and Game, Division of Sport Fish, Soldotna, Alaska.

Emergency orders (EOs)	
Year	Chinook salmon fishing regulations
2011	EO 2-KS-7-06-11 prohibited the use of bait in the Anchor River, Deep Creek, and Ninilchik River drainages beginning June 11 through 11:50 PM, Wednesday, June 22. EO 2-KS-7-07-11 closed the waters of the Anchor River drainage from its mouth upstream to the junction of the North and South forks to sport fishing beginning 12:01 AM, Wednesday, June 15 through 11:59 PM, Thursday, June 30. EO 2-KS-7-16-11 required the use of only 1 unbaited, single-hook, artificial lure in the flowing waters of the Anchor River drainage and closed the salt waters of Cook Inlet at the mouth of the Anchor River to all sport fishing from 2 miles north and south of the Anchor River mouth and 1 mile offshore beginning 12:01 AM, Friday, July 1 through 11:59 PM, Sunday, July 31.
2012	EO 2-KS-7-08-12 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing each Wednesday during the Chinook salmon season beginning 12:01 AM, Saturday, May 19. In addition, this EO also decreases the waters of the Anchor River drainage open to sport fishing by relocating the ADF&G regulatory marker downstream approximately 1,000 feet below the junction of the north and south forks beginning 12:01 AM, Saturday, May 19 through 11:59 PM, Tuesday, July 31. EO 2-KS-7-09-12 limits sport fishing gear to only 1 unbaited, single-hook, artificial lure when fishing in the Anchor River, Deep Creek, and Ninilchik River drainages beginning 12:01 AM, Saturday, June 2 through 11:59 PM, Wednesday, June 20. EO 2-KS-7-10-12 closes waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing beginning 12:01 AM., Saturday, June 9 through 11:59 PM, Saturday, June 30. EO 2-KS-7-13-12 prohibited sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point beginning 12:01 AM, Friday, June 15 through 11:59 PM, Saturday, June 30. EO 2-KS-7-21-12 closed waters of the Anchor River and Ninilchik River, from the mouth upstream approximately 2 miles to ADF&G markers, to sport fishing for any species of fish, beginning 12:01 AM, Sunday, July 1 through 11:59 PM, Sunday, July 15. EO 2-KS-7-22-12 limited sport fishing gear to only 1 unbaited, single-hook, artificial lure when fishing in the Ninilchik River, Deep Creek, Stariski Creek, and Anchor River drainages beginning 12:01 AM, Sunday, July 1 through 11:59 PM, Tuesday, July 31. EO 2-KS-7-23-12 prohibited the retention of Chinook salmon while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point beginning 12:01 AM, Sunday, July 1 through 11:59 PM, Sunday, July 15. Catch-and-release fishing for Chinook salmon is allowed, but Chinook salmon may not be retained or possessed. Chinook salmon that are caught may not be removed from the water and must be released immediately. EO 2-KS-7-41-12 prohibited the retention of Chinook salmon while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River to the latitude of Bluff Point beginning 12:01 AM, Monday, July 16 through 11:59 PM, Tuesday, July 31. Catch-and-release fishing for Chinook salmon is allowed, but Chinook salmon may not be retained or possessed. Chinook salmon that are caught may not be removed from the water and must be released immediately.

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Emergency orders (EOs)	
Year	Chinook salmon fishing regulations
2013	EO 2-KS-7-03-13 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing each Wednesday during the Chinook salmon season and decreased the waters of the Anchor River drainage open to sport fishing by relocating the ADF&G regulatory marker downstream approximately 1,000 feet below the junction of the north and south forks. This EO was effective from 12:01 AM, Wednesday, May 1 through 11:59 PM, Sunday, June 30. EO 2-KS-7-03-13 closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing each Wednesday during the Chinook salmon season and decreased the waters of the Anchor River drainage open to sport fishing by relocating the ADF&G regulatory marker downstream approximately 1,000 feet below the junction of the north and south forks. This EO was effective from 12:01 AM, Wednesday, May 1 through 11:59 PM, Sunday, June 30. EO 2-KS-7-04-13 established a combined annual limit of 2 Chinook salmon 20 inches or greater in length for fish harvested in the Anchor River, Deep Creek, Ninilchik River, and all marine waters south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′ N). In addition, a person who takes and retains a Chinook salmon 20 inches or greater in length from either Deep Creek, Anchor River, or Ninilchik River may not sport fish in any of those drainages for the rest of that day. This EO was effective from 12:01 AM, Wednesday, May 1 through 11:59 PM, Sunday, June 30. Any Chinook salmon caught in these waters and recorded before Wednesday, May 1 on the harvest portion of an Alaska sport fishing license or harvest record card did not count against the 2 Chinook salmon annual limit after 12:01 AM, Wednesday, May 1, but did count against the Cook Inlet annual limit of 5 Chinook salmon. EO 2-KS-7-05-13 limited sport fishing gear to only 1 unbaited, single-hook, artificial lure when fishing in the Anchor River, Deep Creek, or Ninilchik River drainages beginning 12:01 AM, Wednesday, May 1 through 11:59 PM, Sunday, June 30. EO 2-KS-7-17-13 superseded EO 2-KS-7-03-13 and EO 2-KS-7-06-13 issued April 18. This EO closed waters of the Anchor River, Deep Creek, Ninilchik River and Stariski Creek, from the mouth upstream approximately 2 miles to ADF&G markers, or to clearly recognizable physical features, to sport fishing for any species of fish, beginning 12:01 AM, Saturday, June 15 through 11:59 PM, Monday, July 15. EO 2-KS-7-18-13 superseded EO 2-KS-7-04-13, issued April 18. This EO prohibited Chinook salmon fishing (including catch-and-release) while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). Chinook salmon incidentally caught while fishing for other fish may not be removed from the water and must be released immediately. This EO was effective from12:01 AM, Saturday, June 15 through 11:59 PM, Monday, July 15.
2014	EO 2-KS-7-01-14 closed the Anchor River drainage to sport fishing each Wednesday during the Chinook salmon season and reduced the waters of the Anchor River open to sport fishing during the Chinook salmon season. Under this EO, waters open to sport fishing extended from the mouth to the downstream side of the Old Sterling Highway Bridge approximately 550 feet below the junction of the north and south forks. This EO was effective from 12:01 AM, Thursday, May 1 through 11:59 PM, Monday, June 30.

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Emergency orders (EOs)	
Year	Chinook salmon fishing regulations
2014	EO 2-KS-7-02-14 established a combined annual limit of 2 Chinook salmon 20 inches or greater in length in the Anchor River, Deep Creek, Ninilchik River, and all marine waters south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). This emergency order was effective from12:01 AM, Thursday, May 1 through 11:59 PM, Monday, June 30. Chinook salmon harvested in these waters and recorded before Thursday, May 1 and after Monday, June 30 do not count against the 2 Chinook salmon annual limit after 12:01 AM, Thursday, May 1, but do count against the Cook Inlet annual limit of 5 Chinook salmon.
	EO 2-KS-7-03-14 restricted sport fishing gear in the Anchor River, Deep Creek, and Ninilchik river drainages to only 1 unbaited, single-hook, artificial lure beginning 12:01 AM, Thursday, May 1 through 11:59 PM, Monday, 30 June.
	EO 2-KS-7-16-14 superseded EO 1-KS-7-01-14 issued 27 February 2014. This EO closed waters of the Anchor River drainage from its mouth upstream to the junction of the north and south forks to sport fishing; and prohibited Chinook salmon fishing (including catch-and-release) while sport fishing within 1 mile of shore in the salt waters of Cook Inlet south of the latitude of the mouth of the Ninilchik River (lat 60°03.99′N) to the latitude of Bluff Point (lat 59°40.00′N). Chinook salmon incidentally caught while fishing for other fish may not be removed from the water and must be released immediately. This EO was effective from 12:01 AM, Friday, June 13 through 11:59 PM, Monday, June 30.
	EO 2-KS-7-43-14 prohibited sport fishing for Chinook salmon in the salt waters of Cook Inlet north of the latitude of Bluff Point beginning 12:02 AM, Saturday, July 26 through 11:59 PM, Thursday, July 31. Chinook salmon could not be retained or possessed. Chinook salmon caught while fishing for other species could not be removed from the water and had to be released immediately.

APPENDIX B: ANCHOR RIVER ESCAPEMENT COUNTS

Appendix B1.–Combined daily ("day") escapement counts and cumulative ("cum") counts and percent of total from the south and north fork monitoring sites of Chinook, pink, chum, sockeye, and coho salmon, and Dolly Varden at the Anchor River sonar-weir site, 2014.

	Chinook [a]			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
07 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 May	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 May	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 May	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 May	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 May	10	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 May	6	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 May	6	28	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 May [a]	7	35	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 May [a]	3	38	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 May	10	48	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 May	14	62	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 May	10	72	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 May	75	147	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 May	80	227	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 May	15	242	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 May	51	293	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 May	58	351	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 May	114	465	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 May	30	495	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 Jun	7	502	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 Jun	12	514	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 Jun	98	612	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 Jun	43	655	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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	Chinook [a]			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
05 Jun	56	711	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 Jun	20	731	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 Jun	22	753	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 Jun	98	851	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 Jun	52	903	36	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0
10 Jun	48	951	38	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0
11 Jun	50	1,001	40	3	8	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Jun	26	1,027	41	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0
13 Jun	84	1,111	44	1	11	0	0	0	0	0	0	0	1	1	33	0	0	0
14 Jun	82	1,193	48	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
15 Jun	47	1,240	50	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
16 Jun	15	1,255	50	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
17 Jun	13	1,268	51	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
18 Jun	73	1,341	54	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
19 Jun	37	1,378	55	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
20 Jun	65	1,443	58	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
21 Jun	56	1,499	60	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
22 Jun	83	1,582	63	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
23 Jun	39	1,621	65	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
24 Jun	24	1,645	66	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
25 Jun	11	1,656	66	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
26 Jun	11	1,667	67	0	11	0	0	0	0	0	0	0	0	1	33	0	0	0
27 Jun	16	1,683	67	1	12	0	0	0	0	0	0	0	0	1	33	0	0	0
28 Jun	11	1,694	68	2	14	0	0	0	0	0	0	0	0	1	33	0	0	0
29 Jun	5	1,699	68	3	17	0	0	0	0	0	0	0	0	1	33	0	0	0
30 Jun	23	1,722	69	3	20	0	0	0	0	0	0	0	0	1	33	0	0	0
01 Jul	6	1,728	69	5	25	0	0	0	0	0	0	0	0	1	33	0	0	0
02 Jul	7	1,735	69	7	32	0	0	0	0	0	0	0	0	1	33	0	0	0
03 Jul	3	1,738	70	5	37	1	0	0	0	0	0	0	0	1	33	0	0	0
04 Jul	20	1,758	70	13	50	1	2	2	1	0	0	0	0	1	33	0	0	0
05 Jul	43	1,801	72	25	75	1	1	3	2	0	0	0	0	1	33	0	0	0

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	Chinook [a]			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
06 Jul	37	1,838	74	23	98	1	2	5	3	0	0	0	0	1	33	0	0	0
07 Jul	24	1,862	75	71	169	3	5	10	6	0	0	0	0	1	33	0	0	0
08 Jul	6	1,868	75	179	348	5	0	10	6	0	0	0	1	2	67	0	0	0
09 Jul	8	1,876	75	173	521	8	0	10	6	0	0	0	0	2	67	0	0	0
10 Jul	49	1,925	77	310	831	13	0	10	6	0	0	0	0	2	67	0	0	0
11 Jul	257	2,182	87	320	1,151	17	9	19	12	0	0	0	0	2	67	0	0	0
12 Jul	19	2,201	88	355	1,506	23	2	21	13	0	0	0	0	2	67	0	0	0
13 Jul	8	2,209	88	706	2,212	33	2	23	14	0	0	0	0	2	67	0	0	0
14 Jul	14	2,223	89	840	3,052	46	7	30	18	0	0	0	0	2	67	0	0	0
15 Jul	16	2,239	90	679	3,731	56	0	30	18	0	0	0	0	2	67	0	0	0
16 Jul	18	2,257	90	298	4,029	61	0	30	18	1	1	17	0	2	67	0	0	0
17 Jul	20	2,277	91	200	4,229	64	1	31	19	0	1	17	0	2	67	0	0	0
18 Jul	11	2,288	92	150	4,379	66	4	35	21	0	1	17	0	2	67	0	0	0
19 Jul	10	2,298	92	110	4,489	68	3	38	23	1	2	33	0	2	67	0	0	0
20 Jul	9	2,307	92	280	4,769	72	3	41	25	0	2	33	0	2	67	0	0	0
21 Jul	5	2,312	93	173	4,942	75	0	41	25	0	2	33	0	2	67	0	0	0
22 Jul	10	2,322	93	179	5,121	78	1	42	26	0	2	33	0	2	67	1	1	2
23 Jul	7	2,329	93	102	5,223	79	-1	41	25	1	3	50	0	2	67	1	2	4
24 Jul	6	2,335	93	142	5,365	81	5	46	28	0	3	50	0	2	67	0	2	4
25 Jul	11	2,346	94	147	5,512	83	4	50	30	0	3	50	0	2	67	2	4	7
26 Jul	25	2,371	95	304	5,816	88	14	64	39	0	3	50	0	2	67	2	6	11
27 Jul	27	2,398	96	220	6,036	91	13	77	47	0	3	50	0	2	67	4	10	18
28 Jul	13	2,411	96	229	6,265	95	21	98	60	1	4	67	0	2	67	2	12	22
29 Jul	62	2,473	99	90	6,355	96	13	111	68	0	4	67	1	3	100	16	28	51
30 Jul	10	2,483	99	88	6,443	98	7	118	72	0	4	67	0	3	100	2	30	55
31 Jul	9	2,492	100	63	6,506	99	14	132	80	0	4	67	0	3	100	12	42	76
01 Aug	4	2,496	100	27	6,533	99	2	134	82	0	4	67	0	3	100	4	46	84
02 Aug	4	2,500	100	23	6,556	99	11	145	88	2	6	100	0	3	100	2	48	87
03 Aug	−1	2,499	100	48	6,604	100	19	164	100	0	6	100	0	3	100	7	55	100

[a] Chinook salmon counts were interpolated due to equipment malfunction on the south fork from 2130 hours on 20 May to 0630 hours on 21 May.

Appendix B2.–Daily ("day") escapement counts and cumulative ("cum") counts and percent of total of Chinook, pink, chum, sockeye, and coho salmon, and Dolly Varden at the south fork monitoring site on the Anchor River, 2014.

	Chinook [a]			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
14 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 May	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 May	9	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 May	6	20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 May	5	25	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 May [a]	8	33	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 May [a]	3	36	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 May	9	45	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 May	10	55	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 May	9	64	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 May	59	123	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 May	45	168	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 May	16	184	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 May	27	211	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 May	33	244	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 May	52	296	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 May	8	304	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 Jun	2	306	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 Jun	11	317	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 Jun	40	357	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 Jun	32	389	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 Jun	39	428	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 Jun	14	442	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 Jun	15	457	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 Jun	51	508	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 Jun	44	552	48	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0
10 Jun	28	580	50	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0
11 Jun	31	611	53	3	8	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Jun	17	628	54	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0

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	Chinook [a]			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
13 Jun	26	654	56		10	0	0	0	0	0	0	0	0	0	0	0	0	0
14 Jun	26	680	59		10	0	0	0	0	0	0	0	0	0	0	0	0	0
15 Jun	21	701	60		10	0	0	0	0	0	0	0	0	0	0	0	0	0
16 Jun	6	707	61		10	0	0	0	0	0	0	0	0	0	0	0	0	0
17 Jun	11	718	62		10	0	0	0	0	0	0	0	0	0	0	0	0	0
18 Jun	41	759	65		10	0	0	0	0	0	0	0	0	0	0	0	0	0
19 Jun	13	772	66		10	0	0	0	0	0	0	0	0	0	0	0	0	0
20 Jun	21	793	68		10	0	0	0	0	0	0	0	0	0	0	0	0	0
21 Jun	21	814	70		10	0	0	0	0	0	0	0	0	0	0	0	0	0
22 Jun	46	860	74		10	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Jun	4	864	74		10	0	0	0	0	0	0	0	0	0	0	0	0	0
24 Jun	5	869	75		10	0	0	0	0	0	0	0	0	0	0	0	0	0
25 Jun	7	876	75		10	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Jun	3	879	76		10	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Jun	1	880	76	1	11	0	0	0	0	0	0	0	0	0	0	0	0	0
28 Jun	5	885	76	2	13	0	0	0	0	0	0	0	0	0	0	0	0	0
29 Jun	3	888	76	2	15	0	0	0	0	0	0	0	0	0	0	0	0	0
30 Jun	4	892	77	1	16	0	0	0	0	0	0	0	0	0	0	0	0	0
01 Jul	3	895	77	3	19	0	0	0	0	0	0	0	0	0	0	0	0	0
02 Jul	3	898	77	6	25	0	0	0	0	0	0	0	0	0	0	0	0	0
03 Jul	1	899	77	3	28	0	0	0	0	0	0	0	0	0	0	0	0	0
04 Jul	7	906	78	8	36	1	0	0	0	0	0	0	0	0	0	0	0	0
05 Jul	11	917	79	22	58	1	1	1	1	0	0	0	0	0	0	0	0	0
06 Jul	28	945	81	21	79	1	0	1	1	0	0	0	0	0	0	0	0	0
07 Jul	10	955	82	71	150	3	2	3	3	0	0	0	0	0	0	0	0	0
08 Jul	2	957	82	175	325	5	0	3	3	0	0	0	0	0	0	0	0	0
09 Jul	5	962	83	160	485	8	0	3	3	0	0	0	0	0	0	0	0	0
10 Jul	15	977	84	290	775	13	0	3	3	0	0	0	0	0	0	0	0	0
11 Jul	29	1,006	87	265	1,040	18	0	3	3	0	0	0	0	0	0	0	0	0
12 Jul	9	1,015	87	343	1,383	23	0	3	3	0	0	0	0	0	0	0	0	0
13 Jul	5	1,020	88	678	2,061	35	1	4	4	0	0	0	0	0	0	0	0	0

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	Chinook [a]			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
14 Jul	8	1,028	89	727	2,788	47	5	9	9	0	0	0	0	0	0	0	0	0
15 Jul	7	1,035	89	530	3,318	56	0	9	9	0	0	0	0	0	0	0	0	0
16 Jul	16	1,051	91	209	3,527	60	0	9	9	0	0	0	0	0	0	0	0	0
17 Jul	15	1,066	92	155	3,682	62	0	9	9	0	0	0	0	0	0	0	0	0
18 Jul	1	1,067	92	118	3,800	64	3	12	11	0	0	0	0	0	0	0	0	0
19 Jul	7	1,074	93	91	3,891	66	1	13	12	0	0	0	0	0	0	0	0	0
20 Jul	7	1,081	93	259	4,150	70	2	15	14	0	0	0	0	0	0	0	0	0
21 Jul	−1	1,080	93	164	4,314	73	0	15	14	0	0	0	0	0	0	0	0	0
22 Jul	2	1,082	93	174	4,488	76	0	15	14	0	0	0	0	0	0	0	0	0
23 Jul	2	1,084	93	101	4,589	77	0	15	14	0	0	0	0	0	0	1	1	3
24 Jul	2	1,086	94	133	4,722	80	3	18	17	0	0	0	0	0	0	0	1	3
25 Jul	1	1,087	94	146	4,868	82	3	21	20	0	0	0	0	0	0	2	3	9
26 Jul	8	1,095	94	302	5,170	87	13	34	32	0	0	0	0	0	0	1	4	12
27 Jul	19	1,114	96	218	5,388	91	11	45	43	0	0	0	0	0	0	2	6	18
28 Jul	6	1,120	96	242	5,630	95	10	55	52	0	0	0	0	0	0	2	8	24
29 Jul	10	1,130	97	51	5,681	96	3	58	55	0	0	0	1	1	100	10	18	53
30 Jul	11	1,141	98	86	5,767	97	6	64	61	0	0	0	0	1	100	2	20	59
31 Jul	9	1,150	99	57	5,824	98	7	71	68	0	0	0	0	1	100	7	27	79
01 Aug	7	1,157	100	28	5,852	99	3	74	70	0	0	0	0	1	100	2	29	85
02 Aug	3	1,160	100	25	5,877	99	10	84	80	2	2	100	0	1	100	0	29	85
03 Aug	1	1,161	100	47	5,924	100	21	105	100	0	2	100	0	1	100	5	34	100

[a] Chinook salmon counts were interpolated due to equipment malfunction on the south fork from 2130 hours on 20 May to 0630 hours on 21 May.

Appendix B3.–Daily ("day") escapement counts and cumulative ("cum") counts and percent of total of Chinook, pink, chum, sockeye, and coho salmon, and Dolly Varden at the north fork monitoring site on the Anchor River, 2014.

	Chinook			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
07 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 May	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 May	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 May	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 May	−1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 May	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 May	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 May	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 May	−1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 May	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 May	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 May	4	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 May	1	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 May	16	24	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 May	35	59	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 May	−1	58	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 May	24	82	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 May	25	107	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 May	62	169	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 May	22	191	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 Jun	5	196	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 Jun	1	197	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 Jun	58	255	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 Jun	11	266	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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	Chinook			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
05 Jun	17	283	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 Jun	6	289	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 Jun	7	296	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 Jun	47	343	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 Jun	8	351	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 Jun	20	371	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 Jun	19	390	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Jun	9	399	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 Jun	58	457	34	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14 Jun	56	513	38	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15 Jun	26	539	40	−1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 Jun	9	548	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 Jun	2	550	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 Jun	32	582	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 Jun	24	606	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 Jun	44	650	49	−1	−1	0	0	0	0	0	0	0	0	0	0	0	0	0
21 Jun	35	685	51	0	−1	0	0	0	0	0	0	0	0	0	0	0	0	0
22 Jun	37	722	54	0	−1	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Jun	35	757	57	0	−1	0	0	0	0	0	0	0	1	1	50	0	0	0
24 Jun	19	776	58	0	−1	0	0	0	0	0	0	0	0	1	50	0	0	0
25 Jun	4	780	58	0	−1	0	0	0	0	0	0	0	0	1	50	0	0	0
26 Jun	8	788	59	0	−1	0	0	0	0	0	0	0	0	1	50	0	0	0
27 Jun	15	803	60	0	−1	0	0	0	0	0	0	0	0	1	50	0	0	0
28 Jun	6	809	60	0	−1	0	0	0	0	0	0	0	0	1	50	0	0	0
29 Jun	2	811	61	1	0	0	0	0	0	0	0	0	0	1	50	0	0	0
30 Jun	19	830	62	2	2	0	0	0	0	0	0	0	0	1	50	0	0	0
01 Jul	3	833	62	2	4	1	0	0	0	0	0	0	0	1	50	0	0	0
02 Jul	4	837	63	1	5	1	0	0	0	0	0	0	0	1	50	0	0	0
03 Jul	2	839	63	2	7	1	0	0	0	0	0	0	0	1	50	0	0	0
04 Jul	13	852	64	5	12	2	2	2	3	0	0	0	0	1	50	0	0	0

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	Chinook			Dolly Varden			Pink			Chum			Sockeye			Coho		
Date	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%	Day	Cum	%
05 Jul	32	884	66	3	15	2	0	2	3	0	0	0	0	1	50	0	0	0
06 Jul	9	893	67	2	17	3	2	4	7	0	0	0	0	1	50	0	0	0
07 Jul	14	907	68	0	17	3	3	7	12	0	0	0	0	1	50	0	0	0
08 Jul	4	911	68	4	21	3	0	7	12	0	0	0	1	2	100	0	0	0
09 Jul	3	914	68	13	34	5	0	7	12	0	0	0	0	2	100	0	0	0
10 Jul	34	948	71	20	54	8	0	7	12	0	0	0	0	2	100	0	0	0
11 Jul	228	1,176	88	55	109	16	9	16	27	0	0	0	0	2	100	0	0	0
12 Jul	10	1,186	89	12	121	18	2	18	31	0	0	0	0	2	100	0	0	0
13 Jul	3	1,189	89	28	149	22	1	19	32	0	0	0	0	2	100	0	0	0
14 Jul	6	1,195	89	113	262	39	2	21	36	0	0	0	0	2	100	0	0	0
15 Jul	9	1,204	90	149	411	61	0	21	36	0	0	0	0	2	100	0	0	0
16 Jul	2	1,206	90	89	500	74	0	21	36	1	1	25	0	2	100	0	0	0
17 Jul	5	1,211	91	45	545	80	1	22	37	0	1	25	0	2	100	0	0	0
18 Jul	10	1,221	91	32	577	85	1	23	39	0	1	25	0	2	100	0	0	0
19 Jul	3	1,224	91	19	596	88	2	25	42	1	2	50	0	2	100	0	0	0
20 Jul	2	1,226	92	21	617	91	1	26	44	0	2	50	0	2	100	0	0	0
21 Jul	6	1,232	92	9	626	92	0	26	44	0	2	50	0	2	100	0	0	0
22 Jul	8	1,240	93	5	631	93	1	27	46	0	2	50	0	2	100	1	1	5
23 Jul	5	1,245	93	1	632	93	−1	26	44	1	3	75	0	2	100	0	1	5
24 Jul	4	1,249	93	9	641	95	2	28	47	0	3	75	0	2	100	0	1	5
25 Jul	10	1,259	94	1	642	95	1	29	49	0	3	75	0	2	100	0	1	5
26 Jul	17	1,276	95	2	644	95	1	30	51	0	3	75	0	2	100	1	2	10
27 Jul	8	1,284	96	2	646	95	2	32	54	0	3	75	0	2	100	2	4	19
28 Jul	7	1,291	96	−13	633	93	11	43	73	1	4	100	0	2	100	0	4	19
29 Jul	52	1,343	100	39	672	99	10	53	90	0	4	100	0	2	100	6	10	48
30 Jul	−1	1,342	100	2	674	99	1	54	92	0	4	100	0	2	100	0	10	48
31 Jul	0	1,342	100	1	675	100	7	61	103	0	4	100	0	2	100	5	15	71
01 Aug	−3	1,339	100	−3	672	99	−1	60	102	0	4	100	0	2	100	2	17	81
02 Aug	1	1,340	100	−6	666	98	1	61	103	0	4	100	0	2	100	2	19	90
03 Aug	−2	1,338	100	12	678	100	−2	59	100	0	4	100	0	2	100	2	21	100

APPENDIX C: DAILY RIVER STAGE AND TEMPERATURE FOR ANCHOR RIVER, 2014

Appendix C1.–Daily river stage average for the south fork Anchor River, 2014.

Day	Daily river stage average (cm) [a]							
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	55.8	50.6	26.8	21.4	28.1	25.6	–	24.4
2	56.4	44.2	25.2	19.6	25.8	25.4	–	39.2
3	55.1	37.8	23.8	19.7	24.6	25.3	–	28.3
4	51.0	34.0	23.0	20.6	29.8	25.0	–	32.1
5	46.9	31.7	22.1	23.3	48.5	25.9	–	37.6
6	45.8	30.0	21.5	21.6	44.0	25.2	–	44.1
7	45.0	31.0	22.1	20.5	36.4	23.0	–	56.4
8	43.9	32.0	21.7	21.4	31.6	20.2	52.8	63.4
9	40.2	29.9	21.7	21.2	29.8	24.2	48.7	47.5
10	37.6	30.4	26.3	21.3	32.4	24.7	55.8	32.2
11	36.4	28.8	34.0	20.7	31.5	43.5	48.1	22.2
12	35.4	27.5	29.5	19.9	32.2	45.5	61.6	15.2
13	34.4	32.1	27.3	23.6	51.4	37.3	48.2	10.9
14	33.9	34.4	26.2	25.9	40.9	33.6	39.3	37.0
15	32.8	30.0	23.6	31.5	40.6	30.2	35.5	44.5
16	31.0	29.3	21.7	32.8	44.2	28.8	34.4	43.6
17	31.0	34.1	20.1	28.6	41.1	29.4	32.6	24.4
18	31.1	39.4	19.7	26.3	39.1	36.8	32.9	30.1
19	30.1	33.2	19.1	23.3	49.6	33.7	33.2	41.3
20	28.5	29.8	18.7	22.9	54.2	31.1	34.8	49.2
21	27.3	31.9	17.6	21.3	46.0	29.9	45.3	28.0
22	26.7	43.9	16.9	20.9	39.0	28.1	36.6	13.9
23	26.2	39.7	17.1	19.9	35.1	24.0	26.7	21.0
24	25.6	44.7	17.7	28.4	32.7	25.7	16.6	24.8
25	25.2	38.9	20.5	46.7	31.0	21.6	5.7	30.2
26	24.9	35.1	29.8	45.0	29.7	18.4	1.2	23.0
27	27.8	34.3	29.8	35.7	29.2	17.8	-0.9	0.8
28	30.7	31.7	23.5	31.7	28.5	24.4	10.5	6.6
29	30.5	29.1	34.7	45.2	27.5	21.5	12.2	26.2
30	31.6	27.5	29.0	40.3	26.5	23.7	2.7	34.8
31	53.3		23.7	32.6		24.9		27.1

Source: U.S. Geological Survey. 2016. National Water Information System: Web Interface. USGS Current Conditions for Alaska, accessed on 2015-09-25 at URL http://waterdata.usgs.gov/ak/nwis/uv/?site_no=15239900&PARAmeter_cd=00065,00060.

Note: En dashes mean data not available.

[a] Stage data were collected at gauge station USGS 15239900, located approximately 11.4 RKM on the south fork, Anchor River.

Appendix C2.–Daily river temperature average (°C), Anchor River, 2014.

	Daily temperature average (°C)														
	May			June			July			August			September		
Day	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
1	4.9	2.1	7.5	7.5	6.4	9.0	13.8	11.1	17.1	14.3	11.4	17.3	9.2	7.0	11.5
2	5.6	2.7	8.2	8.2	5.7	10.9	14.8	11.5	18.3	14.2	11.0	17.4	10.9	9.3	12.8
3	6.2	3.7	8.6	9.7	6.9	12.7	15.5	13.3	18.0	14.3	13.1	15.7	11.6	9.9	13.4
4	6.8	4.5	9.1	10.9	7.9	14.1	15.7	12.9	18.7	12.8	12.2	14.2	10.6	10.2	11.9
5	6.9	4.9	9.0	11.1	8.3	13.9	15.9	13.0	18.8	12.3	11.1	13.4	9.8	9.4	10.2
6	6.1	5.4	7.5	11.3	8.5	14.0	15.7	14.0	18.0	12.8	11.5	14.2	10.7	9.8	12.0
7	5.4	4.1	6.6	10.4	9.7	12.2	13.7	13.0	15.0	12.5	11.8	13.3	9.8	8.7	10.7
8	6.2	3.7	9.2	10.7	8.1	14.0	14.4	11.3	18.1	12.3	11.4	13.5	9.7	9.1	10.2
9	7.2	4.5	10.0	10.2	9.6	11.6	14.0	13.2	15.8	12.4	11.8	12.9	9.8	9.5	10.3
10	8.0	5.1	11.0	10.5	8.1	13.4	12.6	11.6	13.4	13.0	11.6	14.7	10.1	9.4	11.2
11	8.5	5.9	10.9	11.4	8.9	14.4	12.1	11.3	12.8	13.6	12.2	14.9	10.1	9.1	11.3
12	8.4	7.2	9.7	10.4	9.5	11.8	11.1	10.3	12.0	12.6	12.1	13.6	10.4	10.0	10.8
13	8.8	5.8	12.0	9.0	8.0	10.1	11.5	9.9	13.8	12.7	11.1	15.0	10.6	9.6	11.5
14	9.8	7.0	12.7	10.6	7.5	14.1	13.3	10.8	16.4	12.7	11.8	13.6	10.1	9.7	10.7
15	9.8	6.8	12.8	11.9	10.7	13.4	14.2	11.1	17.6	12.3	10.9	14.1	9.6	9.2	10.0
16	10.2	6.9	13.6	10.4	9.3	11.8	14.9	12.4	17.8	12.1	11.3	12.9	9.5	9.0	9.9
17	11.3	8.1	14.7	9.8	7.9	12.0	15.7	13.5	18.6	12.7	11.2	14.6	9.3	8.7	10.1
18	12.0	9.8	14.6	10.6	8.7	13.0	15.2	12.3	18.4	13.3	11.5	15.9	8.9	8.5	9.4
19	10.2	8.0	12.4	11.1	9.5	13.2	15.3	13.3	18.0	13.3	11.0	15.8	8.8	8.3	9.6
20	8.5	6.4	10.2	11.5	8.4	14.9	14.9	11.9	18.3	13.4	11.3	15.5	8.7	8.0	9.4
21	7.1	5.1	9.0	11.3	10.4	13.2	14.8	11.7	17.8	13.0	10.5	15.6	7.6	6.6	8.5
22	8.0	5.6	10.9	9.4	8.3	10.3	14.6	12.6	16.7	12.7	10.6	14.4	6.6	5.6	7.5
23	9.3	6.2	12.6	10.3	8.2	12.4	15.5	13.1	18.7	11.4	10.1	13.0	6.0	4.6	7.5
24	10.1	7.0	13.3	10.4	8.2	12.3	14.0	13.2	16.0	11.0	10.5	11.5	5.7	4.2	7.3
25	10.7	8.3	13.5	11.8	9.7	14.2	13.2	12.1	14.5	10.8	10.1	11.6	5.2	3.8	6.8
26	10.9	8.5	13.9	11.3	10.6	12.6	13.6	12.0	15.9	11.2	10.1	12.6	4.7	3.3	6.1
27	10.3	9.7	11.5	11.1	9.6	13.3	13.4	10.1	16.7	11.4	10.7	12.3	5.4	4.6	6.7
28	9.5	8.5	10.9	12.9	9.7	16.4	12.4	11.3	14.4	11.0	10.5	11.6	5.3	3.9	6.8
29	8.6	8.2	9.9	14.1	11.3	17.3	13.1	10.8	15.9	10.9	9.7	12.1	4.8	3.7	6.1
30	7.7	7.1	8.4	13.5	12.4	14.7	14.3	11.5	17.3	10.3	8.7	11.7	4.1	2.9	5.2
31	7.4	5.9	9.0				14.8	12.4	17.6	9.7	7.8	11.9			

Source: Temperature data collected by Sue Mauger of Cook Inlet Keeper 0.1 RKM downstream of the south fork resistance board weir.

APPENDIX D: DAILY COUNTS OF STEELHEAD AT THE ANCHOR RIVER

Appendix D1.–Daily upstream and downstream counts of steelhead at the Anchor River at the south fork weir, 2014.

	South fork								
	Upstream count			Downstream count			Net downstream count		
Date[a]	Daily	Cumulative	%	Daily	Cumulative	%	Daily	Cumulative	%
14 May	1	1	2	0	0	0	−1	(1)	−6
15 May	1	2	4	0	0	0	−1	(2)	−12
16 May	3	5	11	1	1	2	−2	(4)	−24
17 May	2	7	15	0	1	2	−2	(6)	−35
18 May	2	9	20	0	1	2	−2	(8)	−47
19 May	2	11	24	2	3	5	0	(8)	−47
20 May	2	13	28	3	6	10	1	(7)	−41
21 May	1	14	30	0	6	10	−1	(8)	−47
22 May	4	18	39	5	11	17	1	(7)	−41
23 May	2	20	43	5	16	25	3	(4)	−24
24 May	5	25	54	8	24	38	3	(1)	−6
25 May	4	29	63	5	29	46	1	0	0
26 May	3	32	70	6	35	56	3	3	18
27 May	0	32	70	1	36	57	1	4	24
28 May	1	33	72	10	46	73	9	13	76
29 May	5	38	83	9	55	87	4	17	100
30 May	3	41	89	3	58	92	0	17	100
31 May	1	42	91	3	61	97	2	19	112
01 Jun	0	42	91	0	61	97	0	19	112
02 Jun	0	42	91	0	61	97	0	19	112
03 Jun	1	43	93	0	61	97	−1	18	106
04 Jun	0	43	93	0	61	97	0	18	106
05 Jun	0	43	93	0	61	97	0	18	106
06 Jun	1	44	96	0	61	97	−1	17	100
07 Jun	0	44	96	1	62	98	1	18	106
08 Jun	0	44	96	0	62	98	0	18	106
09 Jun	0	44	96	0	62	98	0	18	106
10 Jun	1	45	98	0	62	98	−1	17	100
11 Jun	1	46	100	0	62	98	−1	16	94
12 Jun	0	46	100	0	62	98	0	16	94
13 Jun	0	46	100	0	62	98	0	16	94
14 Jun	0	46	100	0	62	98	0	16	94
15 Jun	0	46	100	0	62	98	0	16	94
16 Jun	0	46	100	0	62	98	0	16	94
17 Jun	0	46	100	0	62	98	0	16	94
18 Jun	0	46	100	0	62	98	0	16	94
19 Jun	0	46	100	0	62	98	0	16	94
20 Jun	0	46	100	1	63	100	1	17	100
21 Jun	0	46	100	0	63	100	0	17	100
22 Jun	0	46	100	0	63	100	0	17	100
23 Jun	0	46	100	0	63	100	0	17	100
24 Jun	0	46	100	0	63	100	0	17	100
25 Jun	0	46	100	0	63	100	0	17	100

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	South fork								
	Upstream count			Downstream count			Net downstream count		
Date [a]	Daily	Cumulative	%	Daily	Cumulative	%	Daily	Cumulative	%
26 Jun	0	46	100	0	63	100	0	17	100
27 Jun	0	46	100	0	63	100	0	17	100
28 Jun	0	46	100	0	63	100	0	17	100
29 Jun	0	46	100	0	63	100	0	17	100
30 Jun	0	46	100	0	63	100	0	17	100
01 Jul	0	46	100	0	63	100	0	17	100
02 Jul	0	46	100	0	63	100	0	17	100
03 Jul	0	46	100	0	63	100	0	17	100
04 Jul	0	46	100	0	63	100	0	17	100
05 Jul	0	46	100	0	63	100	0	17	100
06 Jul	0	46	100	0	63	100	0	17	100
07 Jul	0	46	100	0	63	100	0	17	100
08 Jul	0	46	100	0	63	100	0	17	100
09 Jul	0	46	100	0	63	100	0	17	100
10 Jul	0	46	100	0	63	100	0	17	100
11 Jul	0	46	100	0	63	100	0	17	100
12 Jul	0	46	100	0	63	100	0	17	100
13 Jul	0	46	100	0	63	100	0	17	100
14 Jul	0	46	100	0	63	100	0	17	100
15 Jul	0	46	100	0	63	100	0	17	100
16 Jul	0	46	100	0	63	100	0	17	100
17 Jul	0	46	100	0	63	100	0	17	100
18 Jul	0	46	100	0	63	100	0	17	100
19 Jul	0	46	100	0	63	100	0	17	100
20 Jul	0	46	100	0	63	100	0	17	100
21 Jul	0	46	100	0	63	100	0	17	100
22 Jul	0	46	100	0	63	100	0	17	100
23 Jul	0	46	100	0	63	100	0	17	100
24 Jul	0	46	100	0	63	100	0	17	100
25 Jul	0	46	100	0	63	100	0	17	100
26 Jul	0	46	100	0	63	100	0	17	100
27 Jul	0	46	100	0	63	100	0	17	100
28 Jul	0	46	100	0	63	100	0	17	100
29 Jul	0	46	100	0	63	100	0	17	100
30 Jul	0	46	100	0	63	100	0	17	100
31 Jul	0	46	100	0	63	100	0	17	100
01 Aug	0	46	100	0	63	100	0	17	100
02 Aug	0	46	100	0	63	100	0	17	100
03 Aug	0	46	100	0	63	100	0	17	100

[a] Fixed-picket weir abutments were used upstream of the video system to encourage kelts to migrate downstream through the video box. On 31 May, abutments were removed due to the likelihood they would compromise the weir.

Appendix D2.–Daily upstream and downstream counts of steelhead at the Anchor River at the north fork weir, 2014.

	North fork								
	Upstream count			Downstream count			Net downstream count		
Date	Daily	Cumulative	%	Daily	Cumulative	%	Daily	Cumulative	%
07 May	11	11	5	8	8	2	−3	(3)	−2
08 May	23	34	17	17	25	7	−6	(9)	−6
09 May	11	45	22	7	32	9	−4	(13)	−8
10 May	12	57	28	4	36	10	−8	(21)	−13
11 May	13	70	35	5	41	11	−8	(29)	−18
12 May	22	92	46	19	60	16	−3	(32)	−20
13 May	15	107	53	13	73	20	−2	(34)	−21
14 May	16	123	61	20	93	25	4	(30)	−18
15 May	9	132	65	18	111	30	9	(21)	−13
16 May	10	142	70	23	134	37	13	(8)	−5
17 May	10	152	75	22	156	43	12	4	2
18 May	6	158	78	13	169	46	7	11	7
19 May	3	161	80	18	187	51	15	26	16
20 May	9	170	84	26	213	58	17	43	26
21 May	5	175	87	17	230	63	12	55	34
22 May	4	179	89	19	249	68	15	70	43
23 May	4	183	91	12	261	72	8	78	48
24 May	2	185	92	16	277	76	14	92	56
25 May	1	186	92	7	284	78	6	98	60
26 May	0	186	92	6	290	79	6	104	64
27 May	1	187	93	1	291	80	0	104	64
28 May	5	192	95	23	314	86	18	122	75
29 May	3	195	97	25	339	93	22	144	88
30 May	0	195	97	11	350	96	11	155	95
31 May	1	196	97	1	351	96	0	155	95
01 Jun	0	196	97	0	351	96	0	155	95
02 Jun	1	197	98	4	355	97	3	158	97
03 Jun	0	197	98	3	358	98	3	161	99
04 Jun	1	198	98	3	361	99	2	163	100
05 Jun	0	198	98	2	363	99	2	165	101
06 Jun	0	198	98	0	363	99	0	165	101
07 Jun	0	198	98	0	363	99	0	165	101
08 Jun	1	199	99	2	365	100	1	166	102
09 Jun	0	199	99	0	365	100	0	166	102
10 Jun	0	199	99	0	365	100	0	166	102
11 Jun	0	199	99	0	365	100	0	166	102
12 Jun	0	199	99	0	365	100	0	166	102
13 Jun	0	199	99	0	365	100	0	166	102
14 Jun	1	200	99	0	365	100	−1	165	101
15 Jun	1	201	100	0	365	100	−1	164	101
16 Jun	0	201	100	0	365	100	0	164	101
17 Jun	0	201	100	0	365	100	0	164	101
18 Jun	0	201	100	0	365	100	0	164	101

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	North fork								
	Upstream count			Downstream count			Net downstream count		
Date	Daily	Cumulative	%	Daily	Cumulative	%	Daily	Cumulative	%
19 Jun	0	201	100	0	365	100	0	164	101
20 Jun	0	201	100	0	365	100	0	164	101
21 Jun	0	201	100	0	365	100	0	164	101
22 Jun	0	201	100	0	365	100	0	164	101
23 Jun	0	201	100	0	365	100	0	164	101
24 Jun	0	201	100	0	365	100	0	164	101
25 Jun	0	201	100	0	365	100	0	164	101
26 Jun	0	201	100	0	365	100	0	164	101
27 Jun	0	201	100	0	365	100	0	164	101
28 Jun	0	201	100	0	365	100	0	164	101
29 Jun	1	202	100	0	365	100	-1	163	100
30 Jun	0	202	100	0	365	100	0	163	100
01 Jul	0	202	100	0	365	100	0	163	100
02 Jul	0	202	100	0	365	100	0	163	100
03 Jul	0	202	100	0	365	100	0	163	100
04 Jul	0	202	100	0	365	100	0	163	100
05 Jul	0	202	100	0	365	100	0	163	100
06 Jul	0	202	100	0	365	100	0	163	100
07 Jul	0	202	100	0	365	100	0	163	100
08 Jul	0	202	100	0	365	100	0	163	100
09 Jul	0	202	100	0	365	100	0	163	100
10 Jul	0	202	100	0	365	100	0	163	100
11 Jul	0	202	100	0	365	100	0	163	100
12 Jul	0	202	100	0	365	100	0	163	100
13 Jul	0	202	100	0	365	100	0	163	100
14 Jul	0	202	100	0	365	100	0	163	100
15 Jul	0	202	100	0	365	100	0	163	100
16 Jul	0	202	100	0	365	100	0	163	100
17 Jul	0	202	100	0	365	100	0	163	100
18 Jul	0	202	100	0	365	100	0	163	100
19 Jul	0	202	100	0	365	100	0	163	100
20 Jul	0	202	100	0	365	100	0	163	100
21 Jul	0	202	100	0	365	100	0	163	100
22 Jul	0	202	100	0	365	100	0	163	100
23 Jul	0	202	100	0	365	100	0	163	100
24 Jul	0	202	100	0	365	100	0	163	100
25 Jul	0	202	100	0	365	100	0	163	100
26 Jul	0	202	100	0	365	100	0	163	100
27 Jul	0	202	100	0	365	100	0	163	100
28 Jul	0	202	100	0	365	100	0	163	100
29 Jul	0	202	100	0	365	100	0	163	100
30 Jul	0	202	100	0	365	100	0	163	100
31 Jul	0	202	100	0	365	100	0	163	100

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	North fork								
	Upstream count			Downstream count			Net downstream count		
Date	Daily	Cumulative	%	Daily	Cumulative	%	Daily	Cumulative	%
01 Aug	0	202	100	0	365	100	0	163	100
02 Aug	0	202	100	0	365	100	0	163	100
03 Aug	0	202	100	0	365	100	0	163	100